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AUTHORITY

ASD ltr, 5 Mar 1976

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AD INEXPLORATA

AIR FORCE FLIGHT EVALUATION (SYSTEMS) OF THE A-10A PROTOTYPE AIRCRAFT

AFFTC

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TECHNICAL REPORT No. 73-3

MARCH 1973

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(6) AIR FORCE FLIGHT EVALUATION (SYSTEMS) OF THE A-10A PROTOTYPE AIRCRAFT,

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FOREWORD

The Air Force Flight Evaluation of the A-10A aircraft began on 10 October 1972 with the acceptance of the first aircraft from the contractor, the Republic Division of Fairchild Industries. The second aircraft was accepted on 31 October 1972. A total of 138.5 hours was accumulated during 87 flights. The program was completed on 9 December 1972.

This report presents the results of general systems evaluations including functional adequacy, operational effectiveness, quantitative reliability and maintainability, and personnel subsystem test and evaluation. Results of bombing and strafing accuracy evaluations are published in appendix V under separate cover.

Test authority for the program was provided under Program Introduction Document No. P-71-7-10, submitted by the A-X System Program Office, and AFFTC Project Directive No. F-72-4-9.

The following personnel contributed significantly to the A-X Systems Evaluation portion of the A-X Program:

<u>Operations Officer</u>:

Larry D. Fortner, Major, USAF

<u>Project Pilots</u>:

Richard R. Clark, Major, USAF
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<u>Systems Engineers</u>:

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Rodney E. Stubbs, Captain, USAF (Reliability and Maintainability)
Woodrow S. Gilliland, Jr., Captain, USAF (Airframe Subsystems)
Lawrence J. Henderson, Staff Sergeant, USAF (Reliability and Maintainability)
Robert Ard, Captain, USAF (Personnel Subsystem Test and Evaluation)
William E. Kohlenberger, Captain, USAF (Avionics)
Lyle W. Jones (Armament)
Albert V. DiGiovanna (Reliability and Maintainability)
Allan T. Webb (Propulsion)
Richard G. Hector (Weapons Delivery Ground Rules)

Recognition is also extended to the maintenance personnel assigned to the Joint Test Force for contributing to the systems evaluation reports and the reliability and maintainability portion of the program and to the AFFTC Space Positioning branch for their contributions concerning radar tracking and range operations.

Foreign announcement and dissemination by the Defense Documentation Center are not authorized because of technology restrictions of U.S. Export Control Acts as implemented by AFR 400-10.

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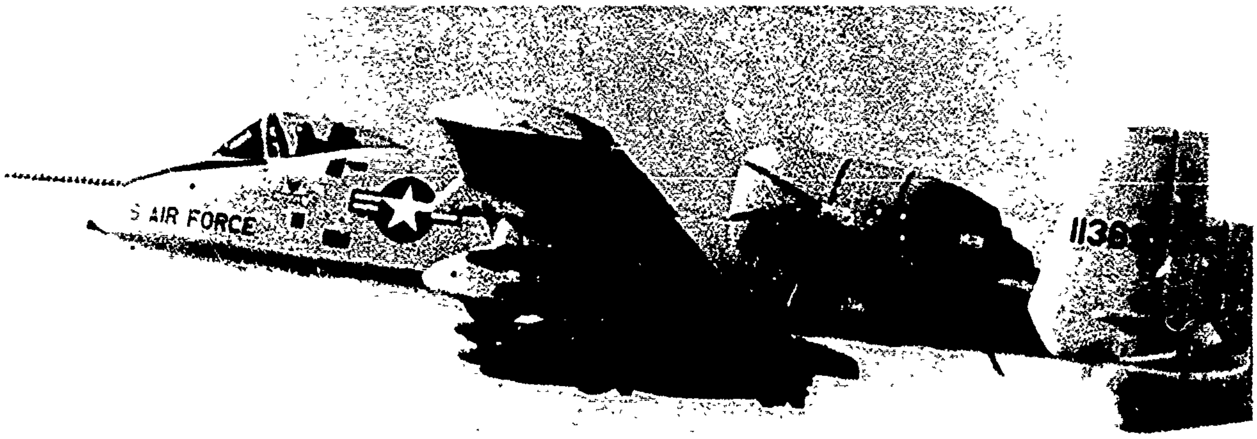

ABSTRACT

This report presents results of the systems evaluation portion of the A-10A prototype Air Force Flight Evaluation. The A-10A weapon system, as tested by the AFFTC, demonstrated or exhibited the potential for acceptable subsystem performance for conduct of the close air support mission. There were many features that were outstanding, or enhanced the aircraft's capability to perform its design mission. These included bombing and strafing accuracy, armament control, cockpit visibility, auxiliary power unit, and maintainability. There were several deficiencies that could have a mission impact and/or safety implication. The most important items included engine/airframe incompatibility, accessibility of cockpit controls, unacceptable operation of the heading and reference system, pilot discomfort caused by the ejection seat, and unacceptable manual reversion control in pitch. Correction of these and other deficiencies contained in this report should be accomplished on any production version of the aircraft. Evaluation of these corrections is mandatory to insure satisfactory mission accomplishment.

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*Published under separate cover.

list of abbreviations

Item	Definition
AFFE	Air Force Flight Evaluation
APU	auxiliary power unit
ATS	air turbine starter
CEA	circular error average (ft)
CPP	Competitive Prototype Phase
FDD	flight-discovered discrepancy
ECS	environmental control system
ECU	environmental control unit
GRU	gyroscopic reference unit
HARS	heading and attitude reference system
HPT	high pressure turbine
HSI	horizontal situation indicator
IDG	integrated drive generator
IR	infrared radiation
ITT	inter-turbine temperature (deg C)
JTF	Joint Test Force
LPT	low pressure turbine
MET	Maintenance Evaluation Team
N_g	gas generator speed
RFP	Request for Proposal
SAS	stability augmentation system
SER	Systems Evaluation Report
SPO	System Program Office
SSAC	Source Selection Advisory Council
SSEB	Source Selection Evaluation Board
TRS	Test Result Sheet
TRU	transformer-rectifier unit

INTRODUCTION

This report presents the results of the A-10A Air Force Flight Evaluation (AFFE) conducted at the Air Force Flight Test Center, Edwards AFB, California. This evaluation was part of the A-X Competitive Prototype Program. The AFFE was initiated on 10 October 1972 and completed on 9 December 1972. The AFFTC was responsible for conduct of the AFFE under the management jurisdiction of the A-X System Program Office (SPO), ASD/SDX. The A-X Joint Test Force (JTF) was composed of representatives from AFFTC, TAC, AFLC, and ATC.

Two A-10A aircraft, S/N 71-1369 and 71-1370, were assigned to the AFFE. As shown in figure 1, a total of 138.5 hours was accumulated during 87 flights of which 60.7 hours were devoted to weapons delivery missions and 13.7 hours to systems evaluations. The remaining flight hours were devoted to performance, flying qualities, and operational suitability evaluations, the results of which are presented in reference 1.

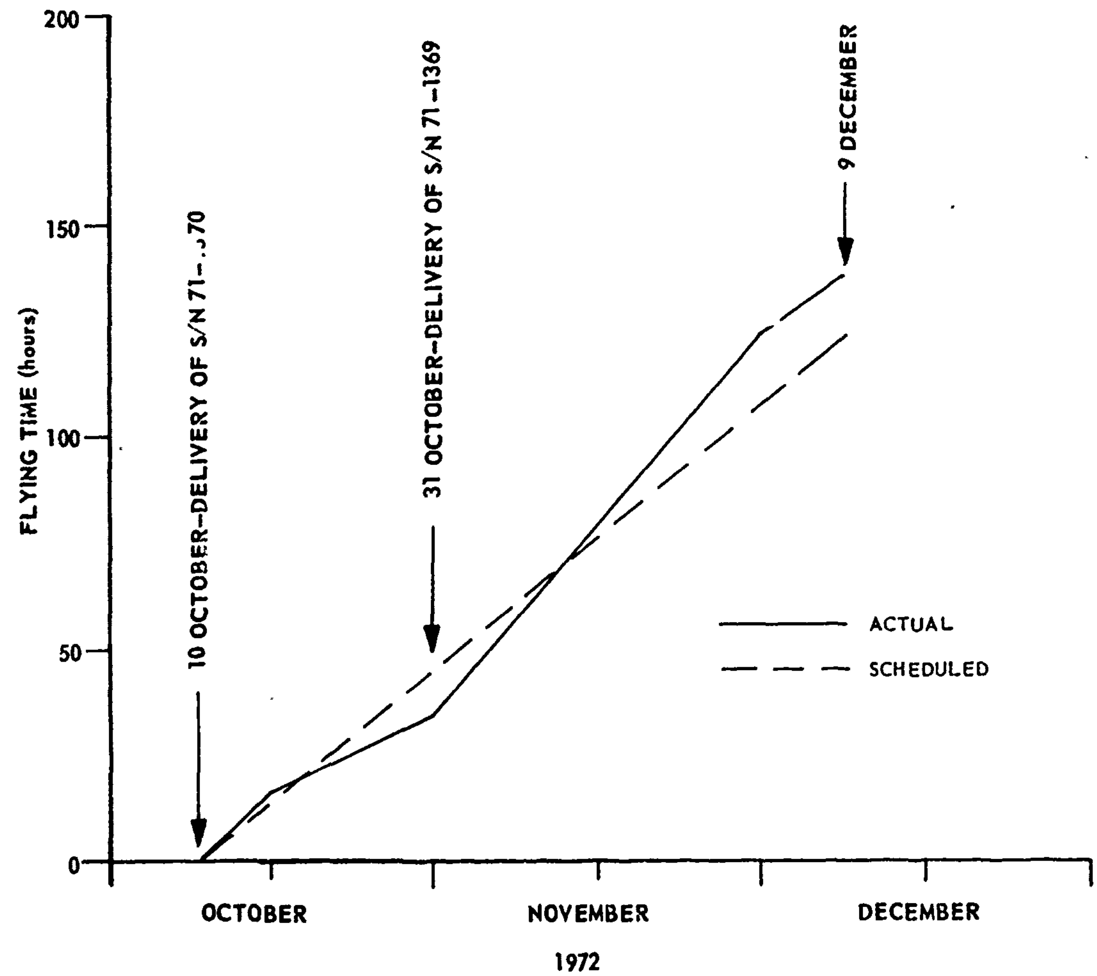


Figure 1 A-10A AFFE Flight Schedule (Acft S/N 71-1369 and 71-1370)

PROGRAM OBJECTIVES

The overall objective of the A-X AFFE was to determine capabilities of the prototype aircraft and its suitability for the close air support mission. Specifically, the systems evaluation objectives stated in the published test plan (reference 2) were to:

1. Determine the functional adequacy and operational effectiveness of the available integrated subsystems, particularly the weapons delivery and 20mm gun systems and compare them to the goals of the Request for Proposal (RFP). Human engineering, life support, systems safety, and vulnerability (component location) aspects were included.

2. Identify any operational limitations which are inherent to the A-X concept and not the result of A-10A design deficiencies.

3. Identify those subsystem and component deficiencies which are inherent to the A-X concept and not the result of A-10A design deficiencies.

4. Conduct limited reliability and maintainability evaluations.

5. Provide results from above objectives to the SPO in an expeditious and orderly manner that will aid in an efficient source selection of an operational/production version of the A-X.

HISTORICAL BACKGROUND

In September 1966, the USAF declared its intent to develop the A-X Specialized Close Air Support aircraft. The following milestones were achieved prior to contract award:

1. Conceptual studies by several contractors - May to September, 1967.

2. Submittal of request for proposal to contractors - May 1970.

3. Submittal of proposals by contractors - August 1970.

On 1 November 1970, contracts were awarded to the Northrop Corporation, Hawthorne, California and the Republic Division of Fairchild Industries, Farmingdale, New York for each to design, develop and test two prototype aircraft. The program was competitive in nature and designated as the competitive prototype phase (CPP). The contractor test effort was designated as Task I and the Air Force test effort was designated as Task II or AFFE. The following milestones were achieved during Task I and II:

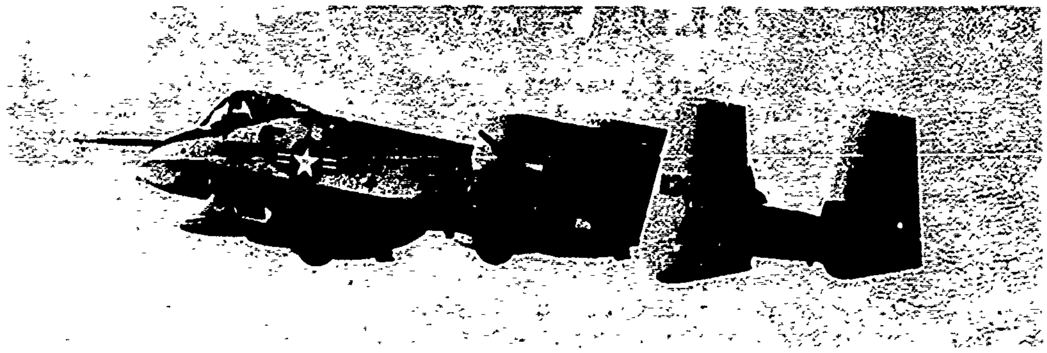
1. First Task I flight - 10 May 1972

2. Delivery of first aircraft to USAF - 10 October 1972

3. First Task II flight - 10 October 1972

4. Delivery of second aircraft to USAF - 31 October 1972

5. Completion of Task II - 9 December 1972



After completion of Task II, a source selection process was pursued by the Air Force. The A-X JTF was represented by a co-chairman for flight evaluation and specific results were presented in written reports and during formal briefings to the A-X Source Selection Evaluation Board (SSEB) and Source Selection Advisory Council (SSAC).

AIRCRAFT DESCRIPTION

The A-10A was a single-place, twin engine close support attack aircraft designed to deliver up to approximately 16,000 pounds of munitions. The engines were YTF34/F5 nonafterburning turbofans each rated at 9,275 pounds of thrust (sea level, standard day, static and uninstalled). Empty and maximum takeoff gross weights of the prototype aircraft were about 23,800 and 45,600 pounds, respectively.

Principal recognition features of the A-10A included a low-wing, low-tail configuration with the two turbofan engines installed in nacelles on pylons extending from the fuselage aft of, and above the wing. Twin vertical tails were located on the outboard tips of the horizontal tail. The one-piece wing was configured with a constant cross section center panel and tapered outer panel sections set at a moderate positive dihedral with drooped wing tips. The forward retracting tricycle landing gear had a wide tread and steerable nosewheel. The nosegear retracted fully into the fuselage and was installed to the right of the aircraft centerline to permit near centerline mounting of the M61A1 gun. The main gear retracted into streamlined pods on the wings with approximately one third of the tire remaining exposed below the pod when fully retracted. The flight controls were powered by two redundant hydraulic systems and were equipped with artificial feel devices to simulate aerodynamic feel for the pilot. A stability augmentation system provided damping in the directional and longitudinal axis. The primary flight controls contained provisions for manual mechanical operation in the event of hydraulic failure. Two-section trailing edge flaps were installed inboard of the ailerons. Split aileron speed brakes were provided with incremental control available to the pilot. Fuel tanks were located in the inboard wing and center fuselage. A 20mm M61A1 gun system which contained 660 rounds of ammunition was installed in the forward fuselage. Stores could be carried on 11 external pylon stations located on the wings and fuselage. Cockpit pressurization was not provided. A self-starting auxiliary power unit was provided to supply compressed air for engine starting. The A-10A contained very limited avionics, consisting primarily of a UHF radio, IFF (Mode 1, 2, 3/A), tacan, and a heading and attitude reference system (HARS). Additional information can be found in appendix I and references 3 and 4.

TEST AND EVALUATION

This section of the report presents overall test results. Detailed results are contained in appendixes II, IV and V. Appendix II contains aircraft subsystems test results. In addition, test results from two flights (3 hours total time) made after completion of Task II to evaluate contractor modification of the A-10A airframe as a solution to the YTF34 engine/A-10A airframe incompatibility problem are also included. Appendix IV contains reliability data acquisition procedures and maintainability results. Appendix V presents Task II weapons delivery ground rules and results. Results from three additional bomb delivery sorties made to evaluate accuracy under contractor-proposed optimum release conditions using standard range patterns are also included. Appendix V is published under separate cover. Specific deficiencies were documented in A-X Systems Evaluation Reports (SER's) which are included in their entirety in appendix III. These reports were formal JTF reports used by all JTF personnel and recognized officially by the SPO. The deficiencies should be corrected as appropriate in any production version of the aircraft. An evaluation of these corrections should be conducted to insure satisfactory mission accomplishment. **(R 1)**[1]

Other evaluations included operational suitability, performance, flying qualities, maintenance and infrared radiation (IR) signature. Results of the operational suitability evaluation were submitted to TAWC/TAC. The maintenance evaluation consisted of identifying maintenance-related deficiencies, requirements for manning and special tools, etc. This was accomplished primarily by monitoring contractor maintenance activities. Results were submitted to the A-X SPO by the Maintenance Evaluation Team (MET). The IR signature tests were conducted by personnel at the Naval Weapon Center, China Lake, California and results were submitted directly to the A-X SPO. A quantitative survivability and vulnerability evaluation was the responsibility of personnel from the SPO.

An A-37B Weapons Training Program was conducted prior to the AFFE to aid in selecting the pilots for the AFFE and to check and refine the weapons delivery ground rules, scoring procedures, and mission profiles. Results were documented in a letter report (reference 5) to the A-X SPO.

PROGRAM RESTRAINTS

Several restraints were associated with the systems evaluation program and included the following:

1. Limited testing. 13.7 hours of primary time were flown to evaluate the various subsystems. Only six hours were originally scheduled.

2. Small sampling of number of aircraft and flying time. Only two aircraft were tested for a total of 138.5 hours during a two-month period.

3. Limited environmental conditions. The AFFE was conducted during the fall, therefore, environmental extremes were not experienced. Severe weather conditions would probably have an impact on the various subsystems.

[1] **Boldface numerals correspond to the recommendation numbers tabulated in the Conclusions and Recommendations section of this report.**

4. Limited instrumentation. Some of the subsystems had very little or no instrumentation. Therefore, these evaluations were primarily qualitative and limited in scope.

OVERALL WEAPON SYSTEM EVALUATION

The A-10A weapon system, as evaluated during the AFFE, demonstrated or exhibited the potential for acceptable subsystem performance for conduct of the close air support mission. No problems were noted that were peculiar to the A-X concept. The following specific items enhanced the aircraft capability to perform the design mission. Details are contained in appendixes II, IV, and V. No specific priority was considered in presentation of this list.

1. Weapons delivery accuracy. The overall bombing circular error average (CEA) during the weapons delivery competition was 109 feet. This CEA was reduced to 44 feet using standard range patterns and the more optimum release conditions specified by the contractor. During the strafing competition, the average percentage of hits on a 20- by 20-foot banner was 61.4 percent for a 15-degree dive and 18.2 percent for a 45-degree dive.

2. Armament control. Ease of operation under all conditions was outstanding.

3. Visibility. The side and aft visibility was outstanding.

4. Auxiliary power unit (APU). Autonomous operation of the APU was excellent and eliminated the requirement for aerospace ground equipment.

5. Maintainability. Overall maintainability was considered excellent. This was determined during qualitative maintenance and quantitative maintainability evaluations.

The following paragraphs are general evaluations of major subsystems. They discuss desirable features and deficiencies that could have a mission impact and/or safety implication. Specific recommendations are contained in SER's (appendix III).

Airframe

No major problems were noted with the primary and secondary structure and with the M61A1 gun installation.

The engine/airframe compatibility was unacceptable; wing turbulence at high angles of attack disturbed the engine inlet flow field and resulted in engine compressor stalls. Details are contained in appendix II. After the AFFE, the contractor modified the aircraft by installing a leading edge slat, trailing edge wing fillet, wing stall strip and two lower strakes. This appeared to correct the deficiency.

There were numerous items related to maintenance that were documented in SER's. Examples included poor access to the speed brake actuator and fuel cell probes.

Cockpit

In general, cockpit control functional grouping was satisfactory. The speed brake preselect control was excellent because specific positioning of the speed brakes was available with minimum pilot attention required. The internal lighting was satisfactory. The accelerometer was located on the canopy bow and therefore did not require a head-in-the-cockpit movement during critical phases of flight, such as during pull-up following a weapon release. Location of the UHF/IFF controls on the left console was good. They were easily referenced and actuated without requiring the pilot to switch hands on the stick.

General accessibility of cockpit controls was not acceptable. There were numerous items that were beyond the reach of 5th to 95th percentile pilots. Examples included the throttles (2 inches too far forward) and weapon release mode jettison switch (1.25 inches beyond reach). This, combined with the uncomfortable parachute mentioned later, will significantly degrade aircrew effectiveness on long duration missions for which the aircraft was designed.

Access to the flap handle was poor and its travel range was too long. In addition the detents were poorly defined, requiring cross-checking with the flap indicator. (SER 10-22-15) Access to the aileron drive switch was poor. This was critical because actuation was required to switch to and from the manual reversion mode. (SER 10-60-52) Use of the anti-skid switch was required during some landing and takeoff emergencies; however, it was inaccessible to pilots with a functional reach at or below the 20th percentile when the shoulder harness was locked. This was unsatisfactory. (SER 10-37-43)

The parachute was extremely uncomfortable and would induce pilot fatigue and degrade mission effectiveness during long duration missions. The parachute had an extremely stiff backing and the oxygen connector pressed into the upper right arm muscle when the right hand was positioned normally on the stick. (SER 10-44-31)

Movement of the right throttle from the IDLE position to OFF occasionally caused the left throttle to be moved to OFF as well. (SER 10-2-1) The vertical velocity indicator was located on the opposite side of the cockpit from the altimeter. This increased the instrument cross-check time and made precision altitude hold maneuvers difficult to fly. The angle-of-attack indicator was also too far from the basic flight instrument grouping causing a blocking of the pilot's view of the range from approach to stall on the indicator. (SER 10-35-27)

The canopy control switch had to be held in OPEN for 12 seconds to open the canopy in the powered mode. This hampered other simultaneous egress procedures and increased egress time. (SER 10-28-51) Forward visibility was somewhat restricted by the canopy bows. This was especially noticeable during weapons delivery. (SER 10-38-42)

Propulsion System

In general, operation of the YTF34/F5 engines was satisfactory during the limited evaluation conducted. This included normal operations, airstarts, throttle transients, and M61A1 gun system firing. Susceptibility of the engines to foreign object damage was very low since the inlets were located approximately 10 feet above the ground and just forward of the wing trailing edge. There was very little engine smoke, and glow from the engines was not visible during night operations. This greatly enhanced the aircraft's capability for escaping detection. The fuel system was functionally adequate.

Engine/airframe compatibility was unacceptable as noted in the Airframe section; however, it appeared that this deficiency was corrected.

The engine scrolls became encrusted with carbon and required cleaning every 25 flight hours. It was believed to have been caused by JP-4 fuel; the engine was basically designed to use JP-5 fuel. (SER 10-65-55)

During engine airstarts, throttle positioning was very critical. With the throttle against the idle stop, crossbleed assist was automatically available for airstarts. However, with the throttle slightly forward of the idle stop crossbleed assist was not available and the engine was placed in a windmill airstart mode; this throttle sensitivity inadvertently resulted in several engine overtemperatures during attempted airstarts. (SER 10-66-56)

The left engine fuel shutoff valve was located so that fuel to the APU was shut off when the left engine fire handle was pulled. (SER 10-3-35) There was no positive means of correcting fuel imbalances. A tank gate switch was installed which interconnected the two main tanks; however, correction of main tank fuel imbalances with this switch was dependant on aircraft attitude. A fuel crossfeed system was also provided; however, it could not positively correct fuel imbalances because the wing tank boost pumps could not be individually controlled. (SER 10-51-40)

The fuel quantity indicating system was inadequate because a single-needle indicator and seven-position selector switch were utilized. The time required to check the status of individual tanks was unacceptable. (SER 10-4-13)

Flight Controls

The primary and secondary flight controls were functionally adequate. Control in manual reversion was satisfactory in roll and yaw. An aileron-rudder interconnect aided in making coordinated turns, particularly during roll-ins for weapons delivery passes. A desirable feature was an elevator-aileron disconnect, provided to disengage selected flight controls in case of a jammed condition. The speed brakes were very effective. No problems were encountered with the emergency retract systems for the speed brakes and flaps.

Lateral stick forces appeared to increase during the program. The cause was unknown. Flying qualities were unacceptable in manual reversion (pitch) during landing (reference 1). (SER 10-60-52)

Airframe and Environmental Systems

The hydraulic, electrical, landing gear, oxygen, g-suit, and heating systems were functionally adequate. Hydraulic temperatures and pressures and electrical voltages were within acceptable limits. No problems were encountered with the landing gear extension/retraction, oxygen, and g-suit systems.

A rapid bleedoff of hydraulic pressure was encountered when engine rpm decayed through approximately 40 percent. This was unacceptable, because switching to the manual reversion mode required several seconds. (SER 10-6-2)

Cockpit cooling was marginal and would probably be inadequate in hot weather. Since the environmental conditions experienced during Task II were very limited, a SER was not submitted. Environmental control system (ECS) noise in the cockpit was irritating and distracting to the pilot. The oxygen overflow vent was located approximately two feet from the nosegear strut and presented the potential hazard of mixing oxygen and oil or grease. (SER 10-12-8)

Malfunctions of the nosewheel electrical control system could cause a hardover of the nosewheel. (SER 10-33-33) In the event of certain anti-skid system failures, both normal and emergency brakes were lost until the anti-skid switch was placed in OFF. (SER 10-69-60)

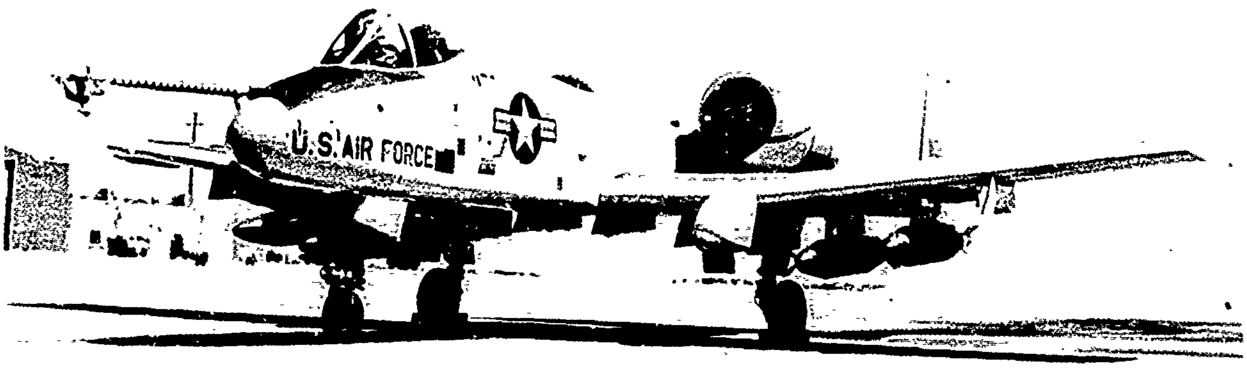
Avionics

The UHF, tacan, IFF (Mode 3) and intercommunications systems were functionally adequate. The maximum range and speech intelligibility of UHF communications were satisfactory. The maximum range and bearing accuracy of the tacan system were satisfactory. No problems were noted with the IFF and intercommunications systems.

The operation of the heading and reference system (HARS) was unacceptable. Precession of the attitude director indicator occurred frequently, particularly during weapons delivery missions. On an operational mission this would degrade weapons delivery accuracy and instrument flying capability. (SER 10-5-19)

Armament

The store suspension and release systems were functionally adequate. Gun gas dispersion was satisfactory; no effects on engine operation were noted. No major problems were noted with the store suspension and release systems and the M61A1 gun system.



CONCLUSIONS AND RECOMMENDATIONS

The A-10A weapon system, as evaluated during the AFFE, demonstrated or exhibited the potential for acceptable subsystem performance for conduct of the close air support mission. There were many features that were outstanding or enhanced the aircraft's capability to perform its design mission. These included bombing and strafing accuracy, armament control, cockpit visibility, auxiliary power unit, and maintainability. Other items that appeared satisfactory are contained in the discussion starting on page 5 of this report.

There were several deficiencies that could have a mission impact and/or safety implications. The most important items included an engine/airframe incompatibility, general cockpit reach, unacceptable operation of the heading and reference system, pilot discomfort caused by the ejection seat, and unacceptable manual reversion control in pitch.

1. These deficiencies and others contained in appendix III of this report should be corrected in any production version of the aircraft. An evaluation of the corrections should be conducted to insure satisfactory mission accomplishment. Specific recommendations are also contained in appendix III (page 4).

APPENDIX I
GENERAL AIRCRAFT INFORMATION

GENERAL DIMENSIONAL DATA

General

Configuration	-	Single-place, low-wing, twin-rudder tail
Power Plant	-	Two GE YTF34/F5 turbofans
Thrust	-	9,275 pounds each
Landing Gear	-	Tricycle gear - single wheel, each with direct acting oleo shock struts

Dimensions

Length (less boom)	52 ft 7 in.
Overall height	14 ft 8.4 in.
Horizontal stabilizer height at root	79 inches
Wing height at centerline	64 in.
Fuselage height (ground to bottom of fuselage)	64 in.
Tail height (ground to bottom of tail)	61 in.
Engine height - inlet centerline	125 in.
Wing span	55 ft
Horizontal tail span	226.0 in.
Main landing gear span (tire centerline)	212.24 in.
Nose landing gear axle to main landing gear axle	231.92 in.
Nose landing gear off center	13 in.
Engine centerline distance from fuselage centerline distance	56 in.

Weight (pounds)

Design gross weight	29,800
Max gross weight	45,600
Useful load	20,500
Empty weight (dry, no pylons, no ammunition, gun included)	20,500
Empty weight (gun, no ammunition, 10 pylons and unusable fuel)*	23,800

*Included approximately 2,000 pounds of flight test instrumentation.

Center of Gravity

	pct MAC
At design weight - gear up	26.2
gear down	28.0
Most forward (gear up)	26
Most aft (gear down)	32
Most abrupt cg shift (gear up to gear down)	1.5 to 1.8 fwd

Landing Gear

Nosegear steering	±40°
Nosegear tire size	24x7.7-10 14-Ply
Main gear tire size	36x11 24-Ply

Wing

Total area	488 sq ft
Taper ratio	0.69
Incidence	-1°
Dihedral (outboard panel)	7°

Vertical Tails

Area (each tail)	52.5 sq ft
Taper ratio	0.61

Horizontal Tail

Total area	118.4 sq ft
Sweepback (at 25 pct chord)	0
Incidence	-7°
Dihedral	0°

Flight Controls

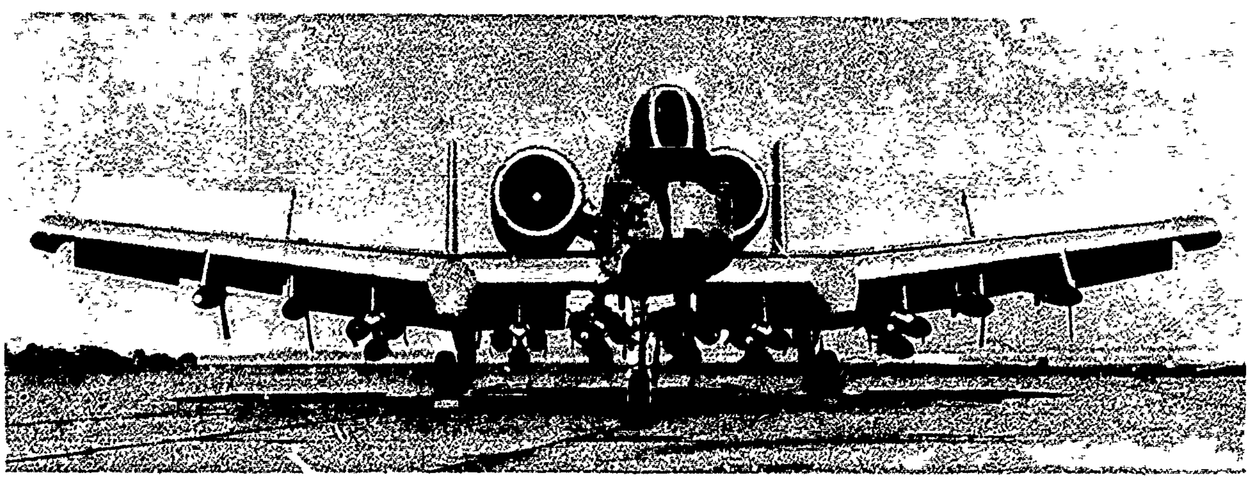
Flap total area	82.9 sq ft
Flap travel	0-40°
Aileron area (total)	48.79 sq ft
Aileron travel	25° up, 15° down
Speed brake total area	92.36 sq ft
Speed brake travel	±65°
Elevator area (total)	28.42 sq ft
Elevator travel	30° up, 10° down
Rudder area (each tail)	11.2 sq ft
Rudder travel	±25°

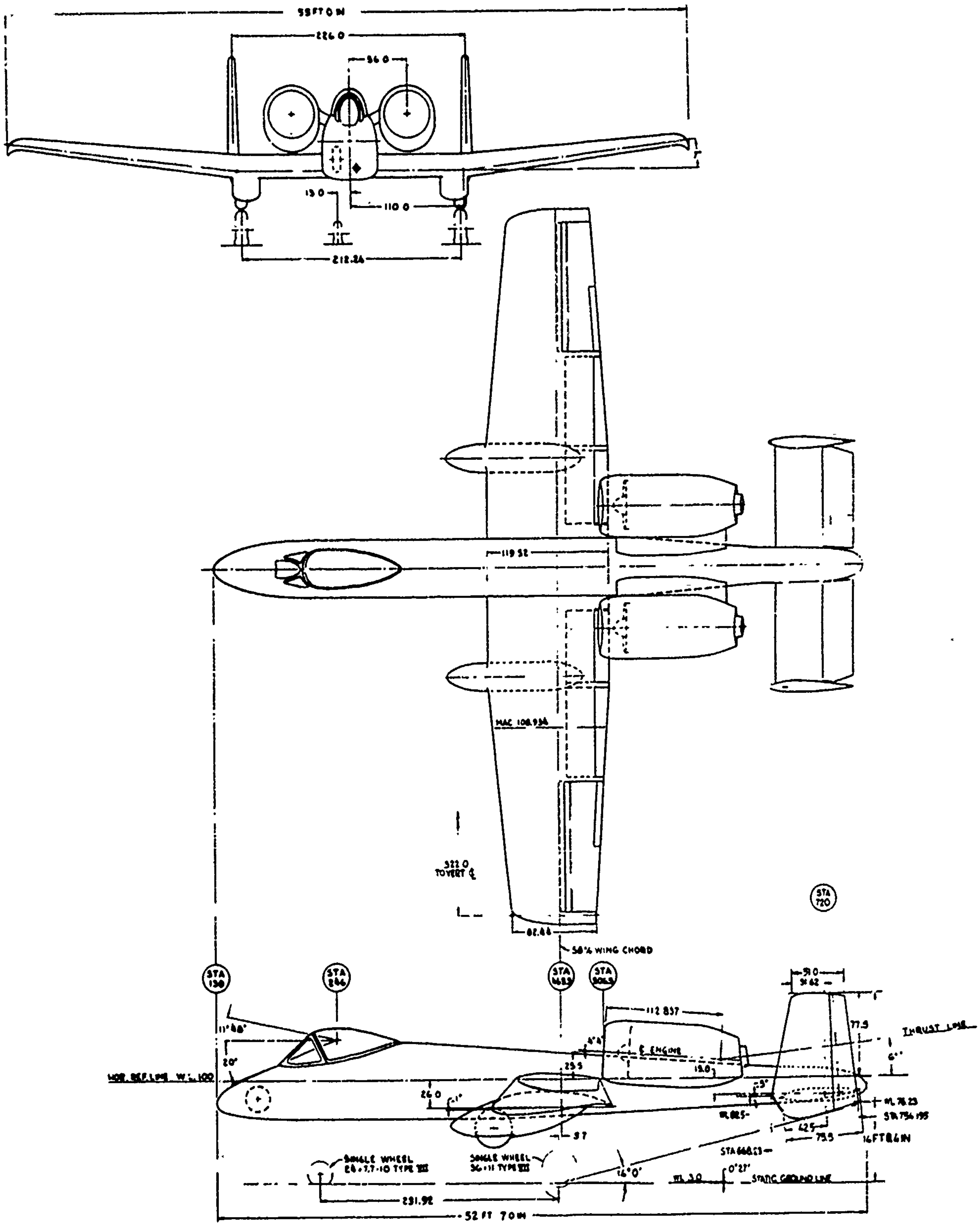
Fuel

Fuel tanks configuration	2 internal fuselage tanks 2 internal wing tanks
Fuel volume (pounds)	
Total capacity	10,010
Left main fuselage	2,755
Right main fuselage	3,055
Left wing	2,100
Right wing	2,100

Armament

Gunsight	Norsight
M61A1 gun system	
Total capacity	660 rounds
Rate of fire	4,000 rounds/min
Burst shots	60 (burst limiter installed for tests)
Gun and feed drive system	hydraulic





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322.0 TO VERT ℄
82.44
58% WING CHORD
STA 130
STA 246
STA 468.3
STA 506.5
112.837
℄ ENGINE
THRUST LINE
HOR. REF. LINE W.L. 100
SINGLE WHEEL 28×7.7-10 TYPE VII
SINGLE WHEEL 36×11 TYPE VII
231.92
52 FT 7.0 IN
STATIC GROUND LINE
14FT 8.6 IN
STA 720

SUBSYSTEMS DESCRIPTION

Airframe

The airframe structure consisted of a conventionally constructed fuselage, low-mounted nonswept wing, horizontal tail, dual vertical stabilizers, one mounted on each end of the horizontal tail, and two externally mounted engine nacelles on the aft fuselage. The fuselage structure was generally made from 7075-T6 aluminum alloy, utilizing both longerons and skin as load bearing members. Hard attachment points were provided in the forward fuselage section for the nose landing gear and either an M61A1 or GAU-8A rapid-firing cannon.

The one-piece wing was attached to the fuselage at four points, two attaching the front spar near the wing neutral axis to the front support bulkhead and the other two attaching the rear spar to the rear support bulkhead. The wing was of constant-chord center-panel construction with only the outer panel having dihedral and aerodynamic twist. Basic construction material was 7075 and 2024 aluminum alloy. The wing center section carried two integral fuel tanks and provided hard mounting points at each end of the wing spar box for attachment of the main landing gear.

The horizontal tail structural box passed completely through the fuselage and was attached at four points in a manner similar to the wing connection. Construction material was the same as that previously described for the wing.

The vertical tails were mounted on each end of the horizontal stabilizer and utilized structural box construction for the fixed portions. Material was the same as that used in the wing.

Each engine nacelle was mounted to the aft fuselage. Forward and rear steel forgings were used to carry the direct and shear thrust loads to the fuselage bulkheads and longerons.

Cockpit

The aircraft had a single-place cockpit with a large windshield and separate bubble canopy for maximum pilot vision. The escape system utilized a modified version of the RAC 1055 ejection seat which could provide successful ejection through the canopy if the canopy jettison system malfunctioned.

Standard flight and engine instruments were provided to keep the pilot informed of critical parameters. These instruments were displayed on the forward instrument panel and left and right consoles along with the aircraft system control switches.

Landing Gear

The retractable tricycle landing gear consisted of main landing gears located in pods below the wing and a nose gear in the forward fuselage. The nose gear was offset to the right of the fuselage centerline to accommodate the internal M61A1 gun. Each gear mounted a single wheel and was hydraulically retracted forward. In the retracted position, with the exception of the lower third of the wheel, the entire main gear was enclosed in a pod beneath the wing and was locked up by uplock hooks which engaged rollers on the gear struts. Folding drag braces stabilized each main gear strut in the gear down position. The nose gear, wheel, tire, retracting mechanism, uplock, downlock and steering were the same as those used on the F-105 aircraft. A single door, hinged to the fuselage and mechanically linked to the drag braces, completely enclosed the wheel well opening when the nose gear was retracted. A two-piece folding drag brace positioned and locked the strut in the down position. Normal landing gear extension and retraction was powered by the No. 1 hydraulic system. An emergency landing gear extension system was provided to unlock the uplocks on all three gears by accumulator pressure. Gravity and aerodynamic pressure then forced the gear into the down and locked position. The accumulator was charged by the No. 2 hydraulic system.

Hydraulically-powered, multiple-steel-disc brakes were provided on each main gear wheel. Brake pressure was normally supplied by the No. 1 hydraulic system and was metered by depression of the rudder pedal tip. Emergency braking, in the event of a failure of the No. 1 hydraulic system, was provided by a 50-cubic inch accumulator. The accumulator was recharged by the No. 2 hydraulic system.

An electrically controlled, hydraulically operated anti-skid system was installed in the wheel brake system to prevent inadvertent wheel locking and blown tires. The system consisted of a wheel speed transducer on each main wheel, a servo control valve in the normal brake pressure line to each main wheel, a control box, a caution annunciator panel warning light and cockpit control switch.

Flight Controls

The primary flight control subsystem was a dual redundant, mechanical command, hydraulic servo-actuated design with a manual backup mode. Two elevators, two ailerons and two rudders were provided. Each was independently controlled by hydraulic powered servo-actuators. The servo-actuators were connected to the cockpit controls by a dual redundant mechanical system which primarily used cables and parallel bellcranks. Since there was no airload feedback to the control stick or rudder pedals, artificial feel was introduced into the system by mechanical springs. In pitch control a bobweight and magnetic damper were used in addition to the springs to provide feel forces proportional to stick displacement from its trimmed position, to velocity of stick movement, and to normal load factor, and pitch acceleration.

Movement of the flight control surfaces was also controlled by trim and, when engaged, by the stability augmentation system (SAS) in the longitudinal and directional axis. Longitudinal and directional axis control automatically reverted to the manual reversion mode when both hydraulic systems were lost. Lateral axis manual control was not achieved until the aileron drive switch was placed in DRIVE TAB and the actuators completed the shift from the drive aileron to the drive tab position. In the drive tab mode, lateral axis control was achieved by means of an aileron servo tab system. Displacement of the tabs was used to deflect the ailerons.

A disengagement system was provided for each aileron and each elevator (right and left). Isolation devices in the mechanical command loop disengaged the control cables to the selected surface when initiated by the pilot. This allowed a jammed surface or actuator to be disconnected from the control stick so that aircraft control could be maintained.

Secondary flight controls consisted of multi-position trailing edge flaps and split aileron speed brakes. Both the flaps and speed brakes were hydraulically powered and both were structurally protected from aerodynamic overload by blowback relief valves integrated into the servo valves. Emergency flap and speed brake retraction switches were provided to allow full retraction of the flaps or speed brakes in the event of a failure in the normal control circuitry or loss of primary hydraulic pressure.

Engines

Two TF34/F5 turbofan engines were mounted in individual nacelles located on the aft fuselage. Sea level, standard day, static thrust was rated at 9,275 pounds for an uninstalled engine and 8,820 pounds for an installed engine.

The engine was a twin-spool, front-fan, axial-flow engine with a bypass ratio of 6.23 to 1. It had a single stage fan and a 14-stage high pressure compressor. The first five high pressure compressor stages utilized variable angle stators. The combustor was an annular type. The two stage high pressure turbine (HPT) on the inner spool drove the high pressure compressor while the four stage low pressure turbine (LPT) on the outer spool drove the fan. The HPT, combustor and high pressure compressor together comprised the gas generator. The two spools were mechanically independent.

An engine-mounted gear box, driven by the gas generator rotor, provided power extraction capability to drive an integrated drive generator, a hydraulic pump, the engine fuel pump and fuel control unit, the main and scavenge lubrication pumps, the ignition generator and the gas generator tachometer. An air-turbine starter unit was also mounted on the gearbox for engine starting. The lubrication system, including engine oil tank, was completely contained on the engine.

The engine utilized an integrated hydro-mechanical/electrical system for complete control of the engine during normal operation, including ground and air starting. This control regulated fuel flow and stator vane position as a function of throttle position, inter-turbine temperature (ITT), gas generator speed (N_g), compressor inlet air temperature and compressor discharge pressure. Fuel was scheduled as a function of N_g below 80-percent N_g and as a function of ITT above 80-percent N_g. Maximum allowable steady state ITT was 833 degrees C (1,531 degrees F).

Basically, four methods of starting an engine were available. These were tenth stage crossbleed assist from the operating engine, auxiliary power unit assisted, ground power unit assisted, and unassisted (windmill) airstarts. During assisted starts, low pressure compressed air was supplied to the engine-mounted air turbine starter (ATS) units. Air from any of the above sources was automatically available when the throttle was positioned at the IDLE stop. Fuel flow and continuous ignition were also initiated when the throttle was advanced through IDLE. Additional information on the A-10A propulsion system can be found in reference 6.

Auxiliary Power Unit

The APU, mounted in the aft fuselage section of the aircraft, consisted of a single-stage centrifugal compressor, an annular combustor, and a radial inward-flow turbine wheel. The shaft power of the turbine wheel drove the compressor, the accessories, and the output drive shaft. A portion of the compressed air was utilized as clean bleed air for starting of the aircraft engines. Accessories included the starter assembly, fuel control unit, oil pressure and scavenge pumps, and time totalizing meter. No separate APU hydraulic pump or generator was provided.

Starting of the APU required only a source of fuel and electrical power. Fuel was supplied from the aft main tank by a dc fuel pump. The electrical power was supplied from the dc battery bus.

Environmental Control System

The ECS provided for temperature control within the cockpit, defogging of the windshield and canopy, anti-g suit pressurization, gun breech and ammunition compartment scavenging, avionics cooling, and oxygen supply. The system was entirely pneumatic in operation, utilizing tenth stage bleed air from both engines. The ECS consisted of heat exchangers, a turbine and fan, moisture separator, environmental control unit (ECU), associated control valves and cockpit controls. Tenth stage bleed air was routed through a mass flow regulator valve to the precooler (air-to-air heat exchanger). From the precooler the air flow was divided into two branches, one duct leading to the inlet of the ECU, while the other branch was routed forward and utilized as service air for the gun breech purging, canopy defogging, and anti-g suit. The ECU provided airflow for cabin temperature regulation. The desired cabin temperature was selected by rotating a variable rheostat on the ECS panel in the cockpit. Airflow from the ECU was regulated by fast response, pneumatic controls. Ram airflow through the cabin was provided through two louvered openings, one on each side of the windshield base structure. Cockpit pressurization was not provided.

During static ground operations, tenth stage engine bleed air entering the precooler was also routed through a control valve to an ejector installed in the overboard exhaust duct of the precooler. The ejector increased the ambient airflow through the precooler and thus increased its efficiency. The ejector control valve was activated to the open position whenever the main landing gear was extended and was closed when the gear was retracted.

Cooling of the avionics and electrical compartments was provided by ram airflow. During ground operation, cooling of these compartments was supplemented by means of a blower which was activated by a nosewheel position switch.

The oxygen system provided the pilot with breathing oxygen at all points in the flight envelope. The system was of the liquid oxygen type, consisting of a 5-liter insulated storage container, a converter, a quantity gauge, an external filler valve, and a regulator.

During operation, the converter changed the liquid oxygen to gaseous oxygen and supplied it under pressure to the regulator. The regulator was an automatic diluter-demand, pressure-breathing type which mixed the oxygen with ambient air and delivered the mixture to the pilot. In normal operation mixture dilution decreased as aircraft altitude increased until 100-percent oxygen was delivered at a pressure altitude of 30,000 feet. However, the pilot could manually select 100-percent oxygen at any time. Although not evaluated, provisions for automatic supply of positive regulator pressure (for pressure breathing) were included above 29,000 feet pressure altitude.

Electrical Power Supply

The primary electrical power source for the aircraft consisted of two isolated 115/200-volt, 400- Hz, three-phase ac systems. Each of these systems received its power from an engine-driven, oil-cooled, integrated drive generator (IDG). Under normal operating conditions, the left engine-driven IDG supplied ac power to the No. 1 main ac bus and ac essential and auxiliary essential busses. The right engine-driven IDG supplied ac power to the No. 2 main ac bus. In the event of failure of either IDG, the remaining operating unit was designed to assume the power requirements of all the ac busses automatically. Secondary power was provided by two 28-volt dc systems. Each of those was powered by a 100-ampere, fan-cooled, transformer rectifier unit (TRU) which received its power from the appropriate main ac bus. Each TRU supplied dc power to a main dc bus. A dc essential bus, an auxiliary essential bus and a battery bus were fed by both TRU's and a 34-ampere-hour, nickel-cadmium battery, all operating in parallel. The battery provided power to the battery bus, the dc essential bus and auxiliary essential bus in the event that both TRU's were inoperative. In the event of a failure of either TRU, the remaining operating unit was designed to support the dc power requirements of all dc busses automatically. The battery also supplied power to a 250-volt-ampere, 115-volt, 400-Hz, three-phase inverter which supplied ac power to the ac essential and auxiliary essential busses in the event of a complete loss of the primary ac system.

In addition to the primary and secondary sources of electrical power, external power could be supplied to the aircraft on the ground from a 115/200-volt, 400-Hz, three-phase source through the external power receptacle located beneath the aircraft.

Lighting

The aircraft lighting system provided both external and internal illumination for night operations. The exterior lighting system consisted of landing and taxi lights, position lights, formation lights, and anti-collision lights. The landing and taxi lights were identical 450-watt iodine/quartz lamps installed on the nose landing gear. The anti-collision lights consisted of three 60-per-minute white flashers, one mounted on each wing tip and the tail. The position lights included red and green lights in the wing tips and a white light at the extreme aft end of the fuselage. The formation lights consisted of white lights installed in the rudder actuator fairing on the left and right vertical fins. These lights were aimed in an upward direction to illuminate the tail numbers on the sides of the vertical fin.

The interior lighting system employed white lighting for all control/display units and general area flood illumination. Separate control devices were provided to permit variation of illumination levels in a group or area division. Ten lighting fixtures were employed for general area flood illumination, five on each side of the crew compartment. Four high-intensity thunderstorm lights were installed to floodlight the instrument panel.

Hydraulic Power Supply

Hydraulic power was supplied by two independent hydraulic supply systems and three emergency hydraulic accumulators. Both hydraulic supply systems operated at a nominal pressure of 3,000 psi and used MIL-H-5606 hydraulic fluid. The hydraulic subsystem was designed to operate throughout a fluid and ambient temperature range of -40 to 275 degrees F. Hydraulic fluid coolers were not used. The two hydraulic supply systems, designated systems one and two, were pressurized by two identical variable delivery engine-driven pumps rated at 28.7 gallons per minute at 5,900 rpm. System one was pressurized by a pump driven by the left engine and system two by a pump on the right engine. Both pumps remained depressurized at speeds below 2,600 rpm to reduce pump torque during engine start-up. Identical bootstrap type piston pressurized reservoirs provided pump inlet fluid at the required pressure.

Hydraulic system one and system two were redundant with respect to the primary flight controls. If either system failed, the other was designed to supply adequate hydraulic power to continue flight.

Hydraulic supply system one powered the primary flight controls, speed brakes, landing gear, wheel brakes, nosewheel steering, and emergency flap retraction accumulator. System two powered the primary flight controls, wing flaps, gun drive, emergency landing gear extension accumulator, and emergency brake accumulator.

Three MS 28797-3 accumulators (50 cubic inches in size) were used as supply sources for emergency wheel braking, landing gear extension, and wing flap retraction. Two nonstandard 10.5-cubic inch accumulators were used to stabilize the reservoir bootstrap pressures.

The lines for each hydraulic system were routed on separate sides of the fuselage and wing in order to maintain maximum system separation. The following was a complete list of aircraft hydraulic power supply systems:

<u>Power Control Systems</u>

Supply System No. 1

Supply System No. 2

<u>Hydraulic Accumulators</u>

Emergency brake accumulator

Emergency landing gear accumulator

Emergency flap retraction accumulator

Supply system No. 1 surge damping accumulator

Supply system No. 2 surge damping accumulator

Fuel Subsystems

The A-10A fuel subsystem consisted of two integral wing tanks and two bladder type fuselage tanks. Fuel capacity was rated at 3,055 pounds for the right fuselage tank, 2,755 pounds for the left fuselage tank, and 2,100 pounds for each wing tank for a total of 10,010 pounds. An ac boost pump was located in each tank. Each main tank boost pump could supply sufficient fuel to support both engines operating at maximum power. A dc boost pump was also installed in the left main tank and was used during engine and APU starts and anytime that the left main pump was inoperative. Its output was sufficient to maintain idle fuel flow requirements of both engines.

The fuel system was separated into two normally isolated systems, one serving each engine. The left wing tank and left main tank fed the left engine and auxiliary power unit through a common manifold. The right wing and right main tanks fed the right engine. The wing pumps operated at a higher output pressure and overrode the main pumps to automatically empty the wing tanks first. The wing tanks had the capability of gravity feeding to their respective main tanks in the event of a wing tank pump failure. Due to the relative head between the wing and main tanks, this would not occur until the main tank level was quite low. In the event of a main tank boost pump failure, crossfeed valves could be opened to allow pressurized fuel to flow to both engines from either tank. The two main tanks could be interconnected to allow utilization of fuel in both fuselage tanks. In the event of a boost pump failure, the affected engine had the capability to suction-feed from the failed tank up to altitudes which caused fuel vaporization. A single-wing refueling receptacle was located in the left landing gear pod.

Avionics

The avionics/communication and navigation systems consisted of an AN/ARC-150(V)-1 UHF command radio set for air-to-air and air-to-ground communication, an AN/ARN-105 tacan set for tactical navigation which operated with a navigation beacon to obtain bearing and slant range information, an AN/APX-92 IFF/SIF set which provided automatic coded replies to radar interrogations from air and surface stations for aircraft identification and air traffic control, and an AN/AIC-25 intercom system which provided a multiple channel audio monitoring facility. All audio signals heard in the headset were routed through or controlled by the intercom system.

An A/A24G-41 HARS was also installed in the aircraft. This consisted of a two-gyro platform gyroscopic reference unit (GRU), control amplifier, compass system controller, and magnetic flux valve. The HARS was designed to interface with the attitude director indicator (ADI) and the horizontal situation indicator (HSI) to present pitch, roll, and stabilized directional information.

Armament

Store Suspension

The A-10A was equipped with 11 external weapon stations. The fuselage centerline station and the two inboard wing stations provided for fuel tank carriage, although fuel lines to these stations were not installed on the prototype aircraft. The centerline station could be utilized for weapon carriage as an alternate to the fuselage shoulder pylon stations. Each of the 11 pylon stations was compatible with forward firing ordinance in addition to conventional munitions carriage. A semipermanent (non-jettisonable) pylon housed a MAU-40/A (MAU-50/A on stations 1, 2, 10 and 11) bomb rack on each station.

M61A1 Gun

The M61A1, 20mm gun system consisted of a six-barrel Gatling gun, rotary storage drum for approximately 660 rounds of ammunition, and a double-ended linkless feed system. The muzzle of the firing barrel was located in the aircraft nose near the fuselage centerline. The gun system was installed on an interchangeable pallet in the lower forward fuselage. Boresighting was accomplished with the pallet either in or out of the aircraft. Gun gas scavenging and purging systems were provided to reduce gun gas concentrations to below hazardous levels in the aircraft. The gun gas scavenging system consisted of a continuous ram air intake at the forward end of the gun bay and louvered exit ramps located at the rear of the ammunition bay compartment. The gun gas purging system consisted of a shroud around the gun breech connected to a large diameter tube vented overboard. Precooled engine bleed air was circulated through the shroud causing suction of the gun gases emitted from the gun breech and overboard venting.

APPENDIX II
SOURCE SELECTION TEST RESULT SHEETS

Test result sheets (TRS's) submitted to the SSEB and SSAC during the A-X source selection process are included in this appendix. Each TRS contains objectives, test procedures, results, restraints, and items required to completely evaluate the specific subsystem. An overall TRS is included for each major subsystem. Appendix IV contains reliability and maintainability results and data acquisition procedures. Appendix V contains weapons delivery ground rules and results. The following list contains the specific TRS's and the order they are presented in this appendix:

Acoustical Noise Analysis

Overall Evaluation of Airframe

Overall Evaluation of Cockpit

- Anthropometric Analysis of Required Reach Distances to Critical Controls
- Emergency Ground Egress and Canopy Operation

Overall Evaluation of Landing Gear System

- Extension and Retraction
- Nosewheel Steering
- Normal and Emergency Braking

Overall Evaluation of Primary Flight Controls

- Normal Operation
- One Hydraulic System Inoperative
- Manual Reversion Mode
- Emergency Disengage System

Overall Evaluation of Secondary Flight Controls

- Flaps
- Speed Brakes
- Stability Augmentation System

Overall Evaluation of Propulsion System

- Normal Operation
- Airstarts
- Throttle Transients

Overall Evaluation of APU

- Normal Operation

Overall Evaluation of Environmental Control System

- Cabin Temperature Survey

Overall Evaluation of Electrical Supply System

- One Generator Inoperative
- Both Generators Inoperative

Overall Evaluation of Lighting System

- External Lighting
- Internal Lighting

Overall Evaluation of Hydraulic System

- One Hydraulic System Inoperative

Overall Evaluation of Fuel System

- Normal Operation
- Fuel Tank Calibration
- Emergency Operation

Overall Evaluation of Avionics Systems

- Tacan
- UHF Communications
- Heading and Attitude Reference System

Overall Evaluation of Armament System

- M61A1 Gun System/Aircraft Compatibility
- Store Suspension and Release

After the AFFE was completed, a follow-on effort was pursued to evaluate fixes to the engine/airframe incompatibility. The specific modifications and results are contained in the last TRS.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: SYSTEMS ENGINEERING (PST&E)	DATE: 11 Dec 72
TEST: A-10A Accoustical Noise Analysis	SSLB RECEIPT: LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To determine if accoustical noise generated by the A-10A is within safe limits and does not otherwise impair mission accomplishment. Specifically:

(1) To evaluate the far-field effect of accoustical noise on the unprotected ear.

(2) To evaluate the near-field effect of accoustical noise on the performance of maintenance tasks.

(3) To evaluate the effect of internal cockpit accoustical noise on pilot performance.

A-10A TEST PROCEDURES AND CONDITIONS:

1. Sound recording equipment operated by representatives from the Accoustics Branch Aerospace Medical Research Laboratory (AMRL), Wright-Patterson AFB, Ohio, was used to collect noise samples.

2. Far-field samples were collected at ten degree intervals around the aircraft from 0° to 180° at a distance of 75 meters. IDLE, APPROACH, CRUISE, and MAX power settings were measured.

3. Near-field samples were collected under IDLE power conditions at selected personnel locations corresponding to customary "hot-engine" maintenance test positions.

4. Internal samples were collected in the cockpit with the canopy closed at four common power settings: GROUND IDLE, FLIGHT IDLE, CRUISE, amd MAX. Each power setting was measured under three ECS conditions: off, normal, and max heat/defog. The microphone was attached to the seat back at ear level.

5. Data were analyzed by AMRL computer program. Results were converted to correspond with standard atmospheric conditions.

A-10A TEST RESULTS:

As shown by the graph in Figure 1, relative sound levels around the A-10A at high power settings follow a different pattern than at lower power settings. Although no levels were found to present an accoustical noise hazard to airfield operations, at higher power settins (CRUISE, MAX) noise was most intense in the beam quadrant; at lower settings the front quadrant was most affected. At 75 meters, ear protection was advisable for beam exposure to MAX power noise for durations exceeding five minutes. (The specified time limit for sustained MAX power is five minutes.) Maximum exposure times are summarized in Table I.

Near-field maintenance positions at which sound levels were sampled are shown in Figure 2. Sound levels at all of these locations with engines at IDLE were well within acceptable limits as shown in Table II. Maintenance personnel with ear protection could spend an entire eight-hour day in these positions without incurring ear damage. APU operation did not contribute significantly to the overall sound level.

Internal cockpit accoustical noise is graphically depicted in Figure 3. Levels were

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well within tolerable limites as attenuated by helmet/communications unit, and were considered not to be a performance degrading factor. ECS operation contributed to the overall noise level as expected, but not to an unreasonable extent.

REMARKS:

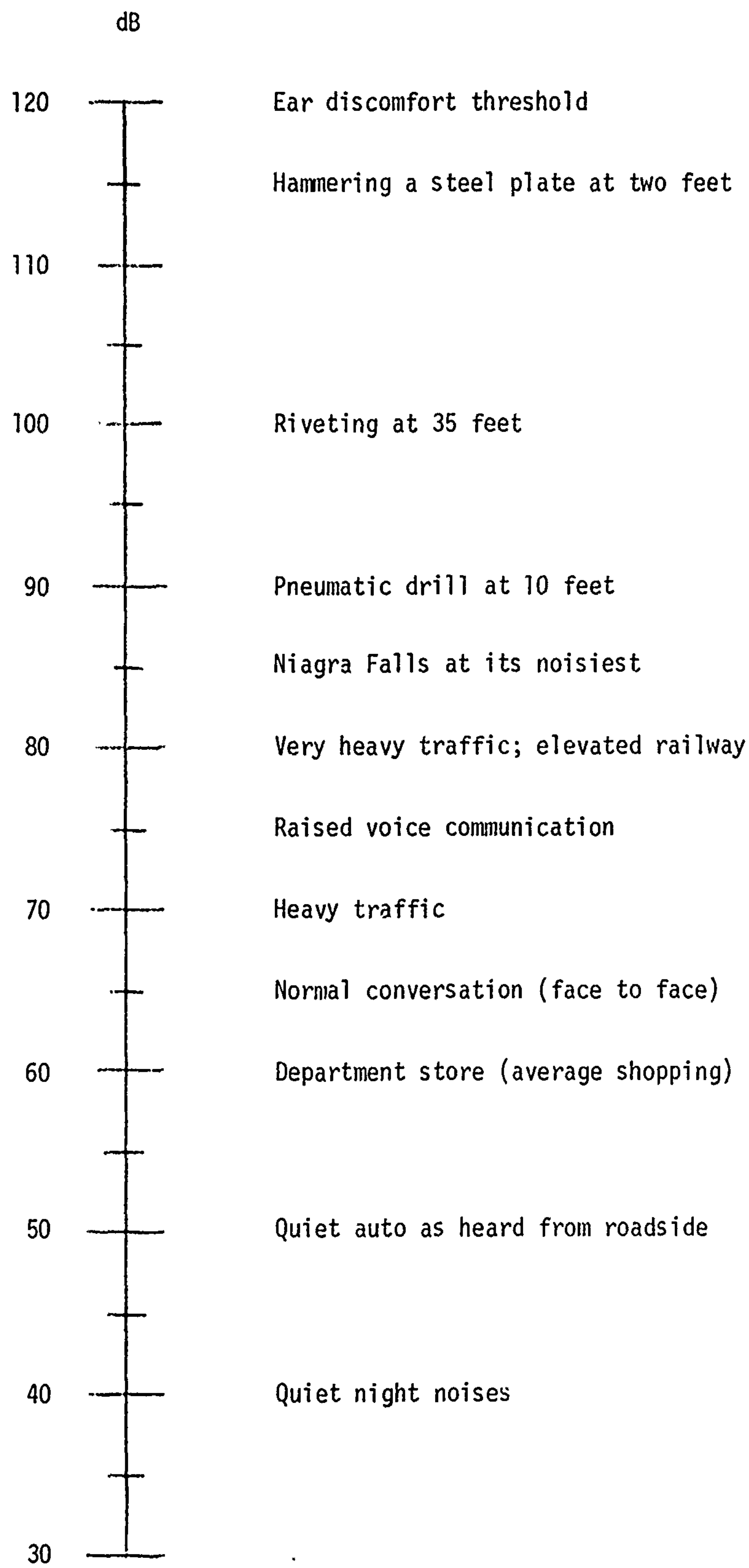
1. Sound pressure levels have not been analyzed by comprising frequencies. Specific frequency band data is available as required for corrective attenuation fix purposes.

2. All noise samples were collected on aircraft SN 71-1370.

3. Data collection was halted during periods at interference by extraneous noise sources.

4. Applicable directives are AFR 160-3, MIL-S-8806B and AFSCDH 1-3, section 3F.

5. The following scale is provided for referential assistance in interpreting the significance of noise levels.


dB
120
Ear discomfort threshold
Hammering a steel plate at two feet
110
100
Riveting at 35 feet
90
Pneumatic drill at 10 feet
Niagra Falls at its noisiest
80
Very heavy traffic; elevated railway
Raised voice communication
70
Heavy traffic
Normal conversation (face to face)
60
Department store (average shopping)
50
Quiet auto as heard from roadside
40
Quiet night noises
30

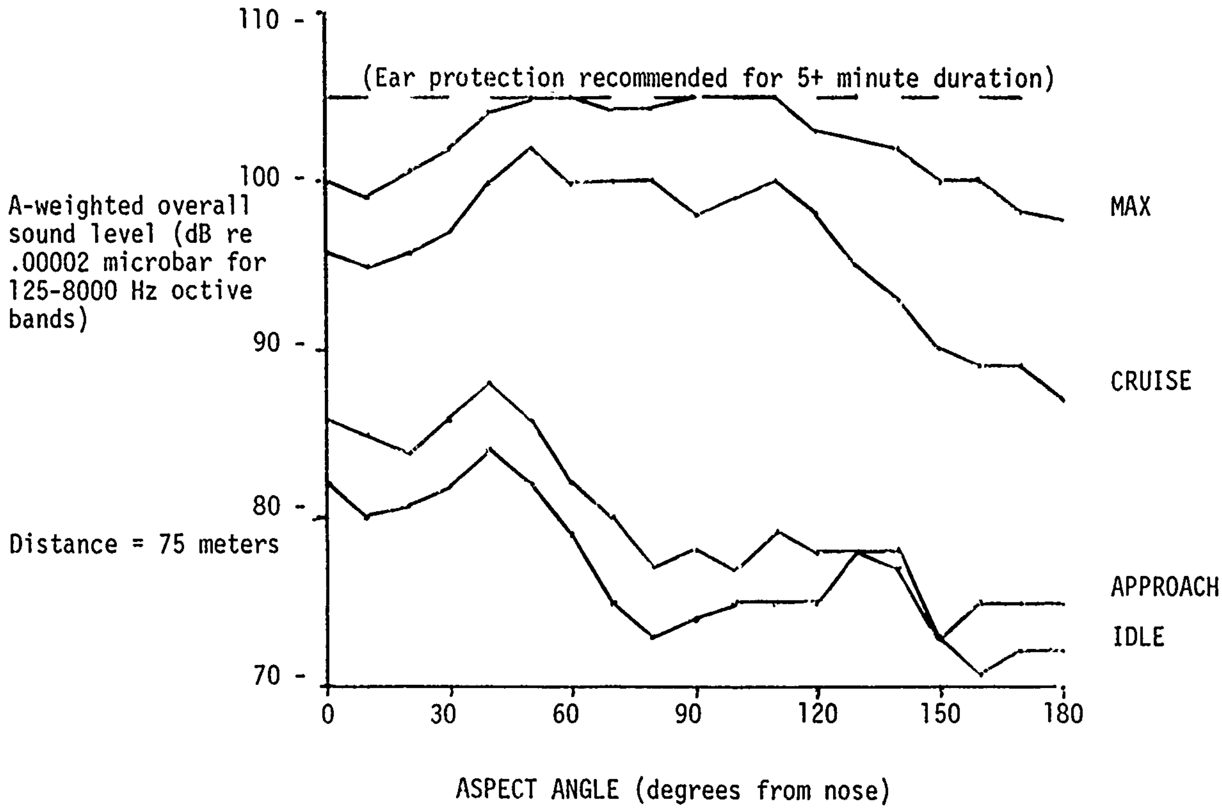


Figure 1. Graph of A-10A sound levels at various power settings by aspect angle.

TABLE I

Maximum exposure time to A-10A without ear protection
at various power settings

POWER SETTING	Avg. maximum exposure time (minutes) at 75 meters		
	Front Quadrant	Beam Quadrant	Stern Quadrant
Idle	480+	480+	480+
Approach	381	480+	480+
Cruise	44	32	170
Max	24	16	61

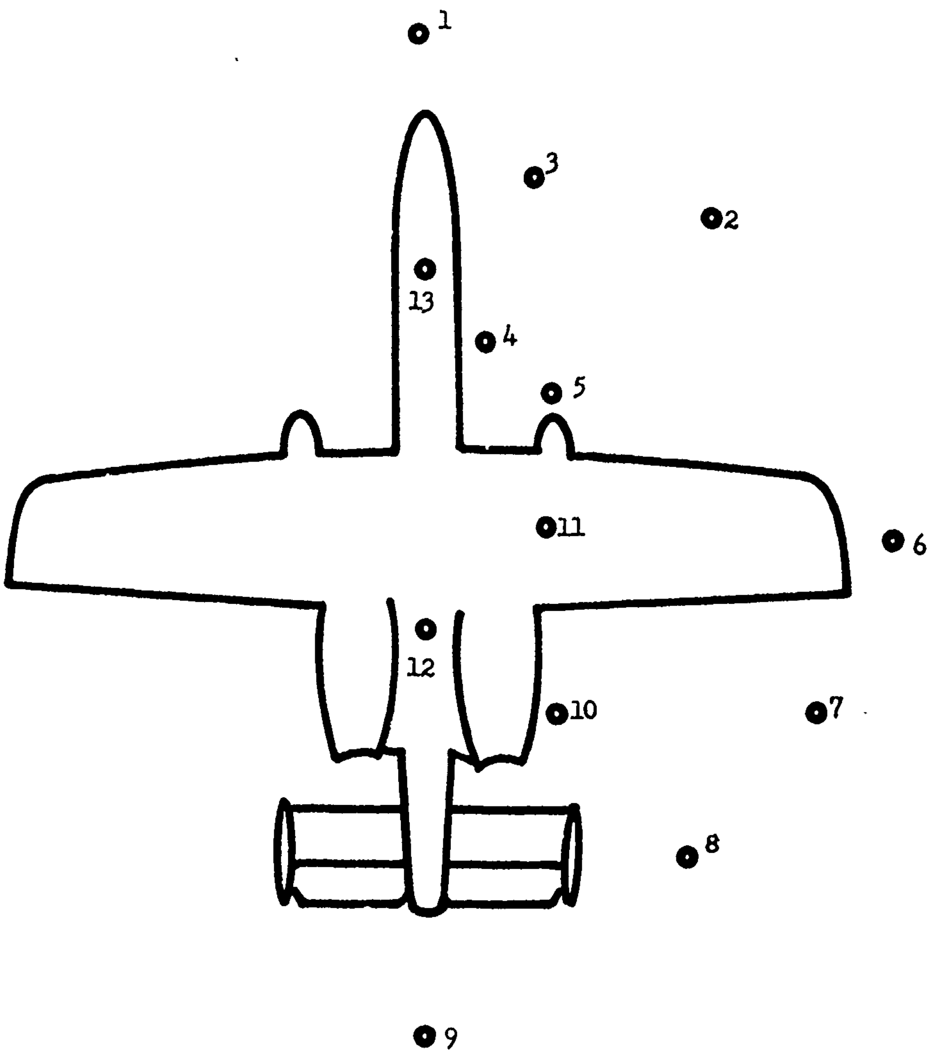


Figure 2 Nearfield Microphone Locations for A 10 Aircraft

TABLE II

A-10A SOUND LEVELS AND MAXIMUM SAFE DURATION AT REQUIRED "HOT-ENGINE" MAINTENANCE POSITIONS

Position No.	Maintenance Task(s)	Avg. Task Time (min)	Sound Level (dB)*	Max. Safe Exposure Time (min)
1	Marshalling In/Out	5	62	480+
2	Refuel Supervision	15	66	480+
3	Engine Start	10	66	480+
4	Arm/Disarm	5	68	480+
5	Refuel	15	72	480+
6	Prelaunch Inspection	5	61	480+
7	Prelaunch Inspection	5	66	480+
8	Prelaunch Inspection	5	68	480+
9	Prelaunch Inspection	5	67	480+
10	Prelaunch Inspection	5	72	480+
11	Prelaunch Inspection	5	67	480+
12	Ext. Air Source Disconnect	2	72	480+
13	Ext. Power Disconnect	2	66	480+

* A-weighted overall sound level in dB (A) re .0002 microbar for 125-8000 Hz octive bands as attenuated by American Optical 1700 ear muffs.

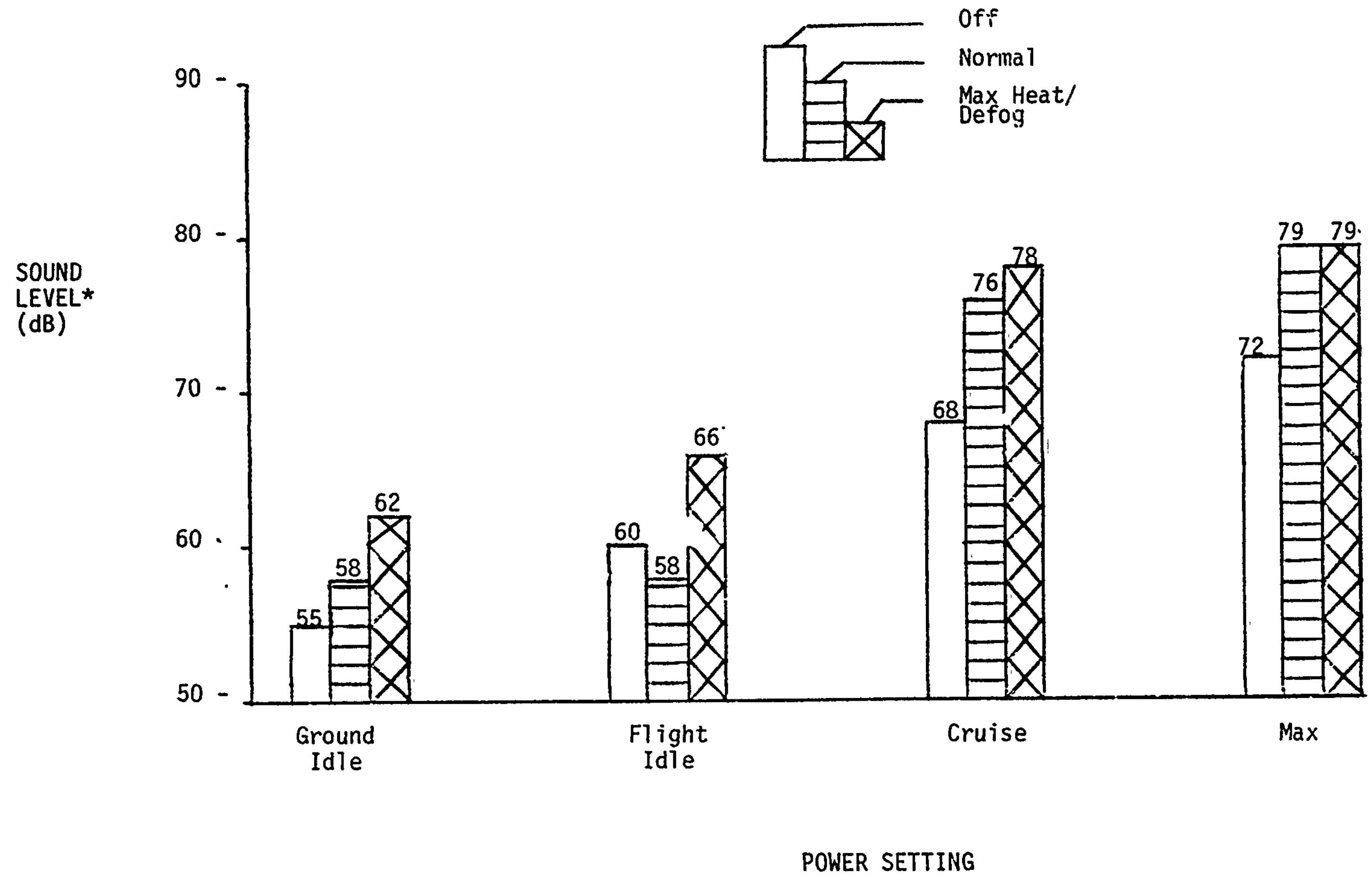


Figure 3. Graph of A-10A cockpit sound levels by power setting and ECS condition.

* A-weighted overall sound level at ear in dB (A) re .00002 microbar for 125-8000 Hz. as attenuated by communication/helmet unit.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Overall Evaluation of Airframe	SSEG RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

To evaluate the overall adequacy of the airframe. No specific test were conducted.

A-10A TEST RESULTS:

Desirable Features:

Although the structural integrity was not specifically evaluated, use of the aircraft was monitored during tests, such as performance, flying qualities, and weapons delivery. During the latter tests, repeated passes were made at dive angles of 10-60 degrees and pullups up to approximately 5 g's. No major problems were noted. However, a crack was found on a stiffener and is discussed in the following section. In addition, no structural problems were noted with the M61A1 gun system installation. Clearance between pylon stations was considered good.

Deficiencies:

Most of the deficiencies concerned items related to maintenance activities and material used. One questionable area was a crack found on the bottom end of the stiffener on the aft side of the aft fuel tank bulkhead. This was noted on one a aircraft only and the cause was unknown. (SER 10-59-50). A complete listing of all airframe SER's is presented in Table 1.

REMARKS:

This evaluation was based on monitoring of Task II tests only. Items required for a complete evaluation include:

1. Weapons delivery up to the maximum gross weights and appropriate g loadings.
2. All weather evaluation.
3. Unprepared surface operations, if required.

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TABLE 1

SER NUMBER	TITLE
10-9-7	Lack of access to speed brake actuator
10-13-9	Poor access to top of fuselage
10-14-10	High vulnerable location of pitot tube to maintenance activities
10-19-11	Poor material utilized in flight control structure
10-16-16	Unaccepable nylon straps retaining lower fuselage access doors
10-24-17	Difficult ingress to cockpit with parachute on
10-50-39	Poor location of APU inlet for unprepared surface operations
10-38-42	Poor forward visibility
10-52-44	Poor access to aileron trim actuator
10-56-45	Large number of fasteners required for engine nacelle access doors
10-57-46	Excessive gap at air inlet duct/engine inlet interface
10-55-47	Potential damage to "coin-slotted" screws during removal
10-59-50	Crack at structure at F.S. 512 (aft fuel tank bulkhead stiffener)
10-28-51	Poor canopy operation for emergency ground egress
10-67-58	Inadequate access to bomb rack electrical connectors in pylon stations 3, 4, 7, 8 and 9
10-68-59	Lack of access panels on wing station pylons 1 and 11

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10 Systems Evaluation	DATE:
TEST: Overall Evaluation of the Cockpit	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and suitability of the cockpit.

A-10A TEST RESULTS:

Desirable Features:

1. General

The functional grouping of cockpit controls on well designed panels was outstanding with only minor exceptions. This feature allows pilots to learn the cockpit arrangement quickly with a minimum of effort. Complementing the excellent functional grouping was the outstanding labeling of the console and instrument panel switches and controls.

2. Armament Panel

The armament panel received a rigorous evaluation on the many weapons delivery missions flown during Task II. The evaluation was limited to the operative functions, but these were used frequently in high workload situations. All pilots commented on its excellent design and easy to see location.

3. UHF Radio, IFF and Intercom

The location of these items on the left console behind the throttle quadrant was outstanding. They were easily seen and operated without having to divert attention from aircraft control or having to remove the right hand from the control stick.

4. Emergency Control Panel

The grouping of many of the cockpit emergency controls on a single panel on the left console was an excellent feature.

5. Caution Light (Annunciator) Panel

The design, operation and location of the caution light panel was outstanding.

6. Engine Temperature Indicators

The engine temperature indicators were designed with a digital dial which displays temperature to the nearest degree. This feature made them very easy to read and set accurately.

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A-10A TEST RESULTS CONTINUED:

7. Speed Brake Preselect

The aircraft was equipped with a speed brake preselect control which was located on the armament panel. It was a definite asset during weapon delivery missions. Speed brakes settings could be selected prior to roll-in and deployed by a single switch actuation without requiring pilot attention.

8. Ram Air Inlet Doors

New doors were designed and installed during Task II. The new doors were simple and easy to close.

9. Cockpit Visibility

One of the most outstanding features of the aircraft was the excellent visibility to the side and rear. Forward visibility was degraded as explained in the deficiency section. Visibility during taxi operations was particularly excellent. The visibility will contribute significantly to mission effectiveness.

10. Engine and APU Fire Handles

The design and location of these items were excellent. They were located on the edge of the instrument panel glare shield and were easily seen and actuated.

11. External Lighting Panel

The design of the panel was outstanding.

12. Attitude Indicator and Horizontal Situation Indicator

The large size of the attitude indicator and HSI, and the functional adequacy of the presentation on the HSI would contribute to precision in instrument flying.

13. Circuit Breaker Panel

The location of critical circuit breakers on a single panel on the center pedestal was an excellent feature.

14. UHF Remote Indicator

The design and location of this item were outstanding. It was particularly useful during instrument and formation flying.

15. Accelerometer

The location of the accelerometer on the front windshield frame allowed the pilot to maintain his head out of the cockpit and refer to the accelerometer which was critical during weapons delivery pullout.

A-10A TEST RESULTS CONTINUED:

Deficiencies:

1. Cockpit Reach Requirements

The A-10 was characterized by its relatively large size compared to other aircraft of similar type. As a result it was difficult for small or average size pilots to reach many of the switches and controls. This feature was a serious deficiency which will be difficult to correct without major redesign.

Controls on the left console forward of the rear edge of the throttle quadrant and at a similar position of the right console were difficult to reach. Controls and switches on the lower half of the front instrument panel were also difficult to reach. The additional space was apparently used inefficiently necessitating the placement of controls aft of the pilot's shoulder line which were difficult to see.

All controls and indicators may be reached and seen by bending forward; however, this design feature was an irritant. It induced additional pilot fatigue on long duration missions and during weapon delivery missions which required frequent changes in weapons panel controls, fuel checks, and navigation mode and course changes. This factor combined with a throttle position which is too far forward and a heavy and uncomfortable parachute detracted from mission effectiveness.

Anthropometric analysis of required reach distances to various cockpit controls is presented in a separate report.

2. Throttles

The design of the throttle shutdown system was unacceptable.

The primary reason for the rating was the possibility of inadvertent double engine shutdowns. (SER 10-2-1). In addition, the throttles were too far forward at MAX power to reach with full authority. They were two inches beyond the functional reach of the fifth precentile pilot (SER 10-1-4).

3. Flap Lever

The relative location of the flap lever and the throttles restricted accessability to the flap lever with the throttles in IDLE. Also, the flap lever displacement was too large, and the flap lever detents were poorly defined (SER 10-22-15).

4. Primary Flight Instruments

The location of the basic four flight instruments (attitude indicator, horizontal situation indicator, airspeed indicator, and altimeter) were optimum; however, the vertical velocity indicator and the angle of attack indicator were in poor locations. The vertical velocity indicator was located across the cockpit from the altimeter. The angle of attack indicator was also too far from the basic grouping for ease in cross checking. In addition, parallox caused a partial blanking at high angles of attack (SER 10-35-27).

5. External Lights Control Panel

The panel was located too far aft on the right console for ease of operation during formation flying (SER 10-31-25).

6. Fuel Quantity Indicating System

The fuel quantity indicator was designed with a single needle dial and a selector switch with positions for each of the four internal tanks, the three external tank positions, and a total internal fuel quantity position. The pilot was required to rotate the switch to each of the positions and allow the needle to stabilize to monitor the status of fuel in each tank. This operation was time consuming and detracted from mission accomplishment particularly when a minor fuel problem existed such as a fuel imbalance (SER 10-4-13).

7. Anti-Skid Switch

The anti-skid switch was located on the lower left edge of the front instrument panel. It was not possible to reach the switch with the shoulder harness locked without turning sideways in the seat and straining. The switch was a critical emergency control during many brake and tire malfunctions (SER 10-37-43).

8. Manual Reversion Controls

The drive aileron/tab switch was located on the hydraulic test panel on the aft portion of the left console. It had to be actuated immediately during transition from the powered to the manual flight control mode to provide lateral control. The switch was difficult to see and actuate in this location without diverting attention from aircraft control (SER 10-60-52).

9. Cockpit Ingress/Egress

The A-10 cockpit was relatively high (approximately 10 feet to canopy rail). Entrance and exit were made with an entrance ladder. No integral cockpit steps were provided to aid the pilot during emergency egress or during normal ingress/egress at austere bases. The likelihood of personnel injury was high (SER 10-45-32). It was almost impossible to enter the cockpit while wearing a parachute without snagging it on the open canopy frame (SER 10-24-17).

10. Parachute

The force deployed parachute utilized was extremely uncomfortable. It would probably induce pilot fatigue and degrade mission effectiveness on long duration missions (SER 10-44-3).

11. Light Test Buttons/Switches

Five separate buttons/switches were used to test the cockpit warning/caution/advisory lights. They are the fire detect and bleed air leak test button, the armament panel light test button, the caution light test button, the signal light test button and the landing gear warning test switch.

A-10A TEST RESULTS CONTINUED:

Their location in five separate areas of the cockpit increased the complexity of cockpit checks unnecessarily and was an inefficient use of valuable cockpit space (SER 10-43-30).

12. Speed Brake Switch

The speed brake switch was a three position switch located on the throttle. The switch throw was too short and the detents were too weak to allow accurate incremental speed brake settings required during some precision maneuvers such as landings and formation flying (SER 10-41-29).

13. Engine Instruments

The engines were primarily controlled by monitoring temperature. During Task I and the early part of Task II, the engine temperature indicators were mounted in the second row of engine instruments. The fan speed indicators were in the first row. This arrangement did not contribute to rapid cross-checking of the engine indicators. During Task II the positions were reversed with excellent results. The engine temperature indicators should remain in the first row followed by the engine core speed indicators. The fan speed indicators should be mounted on the first row of the second column (SER 10-25-18).

The fan speed indicators were calibrated in units of actual RPM (X1000) rather than percent RPM. The indicators were difficult to read. Pilots must mentally compare the reading with a full power rating to determine the engine power output. Fan speed indicators calibrated in percent RPM would be more familiar and would accomplish a comparison automatically. (SER 10-25-18).

14. Hydraulic Pressure Indicators

The hydraulic pressure indicators were too small and had a poorly designed dial face. These factors combined with their location on the right side of the instrument panel made them extremely difficult to read (SER 10-23-22).

15. Throttle Friction Control

The location on the outboard side of the throttle quadrant crowded the flap lever and throttles too close together. In addition, the entire friction range available was unuseable since full decrease resulted in normal friction (SER 10-21-14).

16. Weapons Release Mode Switch

The weapons release mode switch located on the armament panel did not have a labeled OFF position although one exists (SER 10-36-24).

17. Engine Crossfeed and Tank Gate Switch

The engine crossfeed and tank gate switches were located on the left console on the fuel panel. They were actuated to the ON position by moving the switches aft. This movement was unconventional and could result in unintentional activation (SER 10-40-34).

A-10A TEST RESULTS CONTINUED:

18. Cockpit Visibility

The windshield and canopy frame were too wide. Forward visibility was restricted unnecessarily (SER 10-38-12).

19. Canopy Switch

The canopy switch was a three position switch spring-loaded to off and located above the left console. It had to be held in position to achieve canopy actuation. This fact combined with slow canopy actuation rates produced slow emergency egress times, more than half of which was required for canopy actuation (SER 10-28-51).

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: Systems Engineering (PST&E)	DATE; 6 December 1972
TEST: Anthropometric Analysis of Required Reach Distances to Critical Controls in the A-10A Cockpit	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To determine if all cockpit controls requiring operation during flight are within the functional reach of a fifth percentile pilot.

A-10A TEST PROCEDURES AND CONDITIONS:

1. A pilot subject equipped with parachute was seated in the cockpit with seat in the full-up position. Subject was chosen because he possessed a fifth percentile sitting height as determined by representatives from the Anthropology Branch, Aerospace Medical Research Laboratory (AMRL), Wright-Patterson AFB, Ohio.

2. The back of subjects shoulder was used as the measurement reference point, from which a tape measure was extended down the appropriate arm to each control measured. The resultant distances represented required reach from an erect sitting position.

3. The basic functional reach of a fifth percentile pilot, as described in MIL-STD-1472A, Figure 15, was adjusted as follows:

a. Two inches were added to account for forward shoulder hunch typically accompanying reaching;

b. Since different types of controls require different forms of actuation, one quarter inch was added or subtracted accordingly as follows:

TYPE OF CONTROL	INCHES OF ADJUSTMENT	INCHES OF 5th PERCENTILE ADJUSTED FUNCTIONAL REACH
Pushbutton	+0.25	31.25
Toggle Switch	0.00	31.00
Handle/Lever	-0.25	30.75
Rotary Knob	-0.25	30.75

4. Since error of measurement was expected to be no smaller than .25 inch, all measurements were rounded to the nearest quarter inch.

A-10A TEST RESULTS:

Results are summarized in Table 1. Controls found to be within the functional reach of a fifth percentile pilot have no significant implications and therefore are not listed. Similarly, no data were collected on those controls operated solely on the ground. It should be noted that without shoulder harness locked the pilot is free to move ten additional inches forward and is capable of reaching virtually every control surface in the cockpit. Customarily the shoulder harness is locked only in emergency situations. In addition to the results shown in Table 1, initial anthropometric analysis by AMRL representatives revealed that the throttles were two inches beyond the reach of a fifth percentile pilot when set at their full forward (MAX POWER) position (see SER 10-1-4). Also, an earlier investigation of reach requirements to control stick positions in both A-10A aircraft led to contractor repositioning of the 71-1369 control stick on request. All control stick placement extremes are now within the adjusted functional reach of the small pilot. In summary, the A-10A cockpit is large and consequently several areas cannot be conveniently reached by the small pilot. These include the lower

A-10A TEST RESULTS CONTINUED:

portion of the instrument panel which houses landing gear and stores management controls on the left and fuel monitoring on the right. Also, the forward portions of both side consoles are beyond convenient reach. The forward right console, however, houses no critical in-flight controls with the exception of oxygen supply which is marginally within reach. On the left console forward of the throttle quadrant, the reach requirements to the auxiliary engine control panel and the emergency flight control panel are unacceptable. Thus, overall A-10A cockpit anthropometry must be considered marginal. (SER 10-70-61)

REMARKS:

All measurements were taken in aircraft S/N 71-1370. No apparent differences in reach requirements between this aircraft and S/N 71-1369 have been identified by the test pilots with the exception of control stick placement which has been corrected.

TABLE 1

SUMMARY OF EXCESSIVE REACH DISTANCES TO A-10A IN-FLIGHT CONTROLS

CONTROL	TYPE	HAND USED	INCHES OF REQUIRED REACH DISTANCE	INCHES EXCEEDING 5th %ile ADJUSTED FUNCTIONAL REACH
Engine Fuel Flow (L & R)	Toggle Switch	Left	31.50	0.50
External Stores Jettison	Pushbutton	Left	33.25	2.00
Speed Brake Emerg Retract	Toggle Switch	Left	33.25	2.25
Flap Emerg Retract	Toggle Switch	Left	33.25	2.25
Aileron Emerg Disengage	Toggle Switch	Left	31.75	0.75
Elevator Emerg Disengage	Toggle Switch	Left	31.75	0.75
Pitch/Roll Trim O'Ride	Toggle Switch	Left	31.25	0.25
Landing Gear Control (Down Position)[1]	Lever	Left	32.50	1.75
Gear Downlock O'Ride	Pushbutton	Left	31.25	0.00[2]
Taxi Lights	Toggle Switch	Left	31.50	0.50
Wpn Release Mode Jettison	Rotary Knob	Left	32.00	1.25
Emerg Wheel Brakes	Handle	Left	33.00	2.25
Aux Landing Gear Control	Handle	Left[3]	35.00	4.25
Aux Landing Gear Control	Handle	Right	33.00	2.25
Fuel Display Select	Rotary Knob	Right	32.50	1.75

[1] The landing gear lever can be reached satisfactorily in the UP position but requires excessive reach to be actuated with full authority.

[2] The landing gear downlock override pushbutton was found to be exactly at the limit of fifth percentile adjusted functional reach. It is included here because of the criticality of ensuring positive actuation.

[3] The auxiliary landing gear pull handle is located on the right side of the center pedestal for right hand operation. Left hand operation would be desirable in situations requiring the right hand to remain on the control stick.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: Systems Engineering (PST&E)	DATE: 10 December 1972
TEST: A-10A Emergency Ground Egress and Canopy Operation	SSEB RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

To determine if emergency ground egress procedures, cockpit design, and canopy operation permit efficient and expeditious escape.

A-10A TEST PROCEDURES AND CONDITIONS:

1. The normal (powered) operation of canopy opening and closing was timed on both aircraft S/N 71-1369 and 71-1370. Pilot actuated canopy switch and stopwatch simultaneously.

2. A ground emergency requiring rapid egress was simulated with normal canopy operation available. With canopy closed, lap belt and shoulder harness fastened, parachute pack strapped on, and helmet and oxygen mask on, pilot was times as he rapidly performed the appropriate egress procedures identified in T.O. 1A-10A-1, page 3-4. Timing stopped when pilot attained an over-the-side position, ready to jump. The initial evaluation was conducted twice with different pilots and later replicated with a third pilot.

3. The emergency ground egress test was repeated with the additional condition that the simulated emergency included loss of canopy power, necessitating manual opening. This evaluation was also initially conducted twice with different pilots and later replicated with a third pilot.

4. Egress times were recorded by a ground observer with a stopwatch. Immediately following each trial, the pilot was debriefed and comments were recorded.

A-10A TEST RESULTS:

Normal canopy opening and closing times are shown in Table 1 on the attached sheet. It can be seen that canopy opening rates do not differ significantly between the two aircraft. The results of emergency ground egress evaluations are shown in Table 2. With normal canopy operation available, an initial average of 22.6 seconds were required to exit the cockpit. The difference between the performance of A and B pilots was attributed to test environment; pilot A performed the evaluation with engines shutdown and independent of any other tests, whereas pilot B operated with engines running subsequent to flight. For this reason, 25 seconds may be a more realistic egress time estimate. About half this time was utilized to open the canopy. Since the canopy switch is spring-loaded to the STOP position requiring the pilot to hold the switch while the canopy opens, one hand is not available to perform other egress tasks simultaneously. It is believed that use of a canopy switch capable of remaining actuated in an EMERG OPEN position which provides a more rapid opening rate (such as 8 seconds) will significantly reduce ground egress time during an emergency condition (SER 10-28- 51).

In the manual canopy lift mode, an initial average of 34.5 seconds were required to exit the cockpit. Pilot B required only three more seconds to exit the cockpit in the manual canopy lift mode than in the normal (powered) canopy mode. Pilot A, however, had considerable difficulty manually operating the canopy. The essential factor was practice/familiarity. Although emergency ground egress involving manual canopy lift is not easy, it was concluded that egress can be accomplished within specified time limits given sufficient practice/familiarity.

A-10A TEST RESULTS CONTINUED:

In order to verify this conclusion, the egress tests were replicated with a third pilot, Pilot C, who had been briefed on prior pilot performance and procedural difficulties. His egress time of 23 seconds under manual canopy lift conditions confirmed the advantageous effect of familiarity. Thus, it was considered most appropriate for purposes of estimating ground egress time in an operational environment to discount the first manual egress trial (Pilot A) and modify average egress time as shown in Table 2.

REMARKS:

1. Pilot B egress trials were performed at night; this had negligible effect on performance.

2. Pilot A's manual canopy lift trial was the first Air Force attempt at this task. His comments were considered to be quite influential on subsequent pilot's performance.

3. Weather was favorable.

TABLE 1

A-10A NORMAL (POWERED) CANOPY OPERATION RATES

CONDITION	TIME (seconds) A/C 71-1369	A/C 71-1370
Opening (avg.)	11.75	11.95
- First Trial	11.70	11.90
- Second Trial	11.80	12.00
Closing (avg.)	8.20	8.35
- First Trial	8.20	8.40
- Second Trial	8.20	8.30

TABLE 2

A-10A EMERGENCY GROUND EGRESS TIMES

OBSERVATION	EGRESS CONDITION (seconds) Normal	Manual
Pilot A	19.8	40.4[1]
Pilot B	25.3[2]	28.6
Initial Test Average	22.6	34.5[1]
Replication: Pilot C	18.5	23.0
Modified Average (excluding Pilot A trials)[3]	21.9	25.8
Overall Average	21.2	30.7[1]

[1]Exceeds time limit specified in MIL-STD-1472A, paragraph 5.14.4.1.2.

[2]Test initiated with engines actually running.

[3]Modified average represents mean performance after familiarity with procedure.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Overall Evaluation of the Landing Gear System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A landing gear system. The landing gear system was composed of:

1. Suspension system
2. Extension and retraction system
3. Braking system
4. Nosewheel steering system

A-10A TEST RESULTS:

Desirable Features:

1. Operation of suspension system.

2. Operation of extension and retraction system.

Deficiencies:

Major problems were susceptibility of the nosewheel steering system to hardover failures (SER 10-33-33), the loss of normal and emergency braking during anti-skid malfunctions (SER to be submitted) and the poor location of brake components for forward airstrip operations (SER 10-7-3). Other landing gear deficiencies were:

SER NUMBER	TITLE
10-61-53	Loss of normal braking system with both electrical systems inoperative
10-37-43	Unacceptable location of anti-skid switch

REMARKS: The above test results were based on a limited evaluation which aside from the specific tests conducted, primarily consisted of monitoring system operation during Task II. No landing gear instrumentation was available and all results were qualitative. A complete evaluation would include:

1. Instrumentation of critical landing gear parameters
2. Max energy brake tests
3. Wet runway brake tests
4. Extension and retraction tests
5. Nosewheel steering tests
6. Adverse weather operation
7. Rough field operation

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Landing Gear - Extension and Retraction	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of normal landing gear extension and retraction and emergency landing gear extension systems.

A-10A TEST RESULTS:

Normal Operation:

During normal operation the landing gear extension and retraction system performed satisfactorily. Landing gear operation was reliable and no major problems were experienced. Approximately 10 seconds or less were required to extend or retract the gear. The landing gear indicating system also worked well with no problems.

Emergency Operation:

Emergency landing gear extension was accomplished by pulling the auxiliary landing gear extension handle which directed hydraulic pressure from an accumulator to release the landing gear uplocks. With the uplocks released, the gear then free fell aided by gravity and aerodynamic drag, to the down and locked position. The system was checked for proper operation 6 times, and in at least two cases was subject to extremely slow nosegear extension. During one extension, at 135 KIAS, the nosegear took more than 45 seconds to lock. In another test, over 2 minutes were required for nosegear locking. During this test, the pilot had to accelerate to 175 KIAS before the nosegear would lock. This problem was intermittent and could not be explained. Further investigation should be conducted to determine the cause of the problem. Several emergency extensions were made in approximately 30 seconds at 135 KIAS which was considered normal. Extension time could be slightly decreased by increasing airspeed or placing a positive "g" load (greater than 1) on the aircraft.

REMARKS:

The above test results were based on a very limited evaluation. No hydraulic system instrumentation was available. A complete evaluation would include similar tests with critical landing gear parameters instrumented.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Landing Gear - Nosewheel Steering	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A nosewheel steering system during normal operation.

A-10A TEST RESULTS:

Steering effectiveness was considered marginal. Steering control was very sensitive around center due to lack of any dead band about the centered position. Also, some pilots disliked the requirement to continually hold the steering button on the stick grip while using nosewheel steering. No problems were encountered due to the offset location of the nosegear.

The nosewheel steering system was subject to hardover failures to either the full left or full right position during electrical malfunctions (SER 10-33-33). Because of this problem, the Flight Manual prohibited use of nosewheel steering during takeoff and landing roll. During Task II no hardover malfunctions were experienced. However, due to the safety hazards involved with hardover malfunctions and the resultant limitations imposed by the Flight Manual, the system was considered unacceptable.

REMARKS:

The above test results were based on a very limited evaluation which consisted of monitoring system operation during Task II. No hydraulic or electrical system instrumentation was available. A complete evaluation would include instrumentation of critical nosewheel steering parameters.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Landing Gear - Normal and Emergency Braking	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy of the A-10A braking system during normal and emergency operations.

A-10A TEST RESULTS:

Normal Operation:

During normal operation, the brake pedal forces were considered too soft. The brake pedal position was not linear with brake pedal force, the pedal being very easy to push to full travel. This could have caused skidding, without anti-skid protection available. The brakes were adequate to hold the aircraft for a full power runup on both engines. From a functional standpoint the brakes were adequate for normal operations; however, it was felt that brake pedal forces had not been optimized. Further investigation is necessary to determine an optimum brake pedal force versus pedal position gradient.

The anti-skid system was adequate although it was probably not optimized for maximum braking performance. It was effective in preventing tire skidding and was considered a desirable feature for the aircraft.

Emergency Operation:

Emergency braking with the No. 1 hydraulic system inoperative was essentially unchanged from normal braking although anti-skid protection was not available. Steering control with differential braking was satisfactory. Emergency braking with both hydraulic systems shutdown was also satisfactory.

Several successful stops were made during manual reversion landings using the emergency brake system. Fifteen to seventeen brake applications were found to be available from the emergency brake accumulator during a test on aircraft SN 71-1369. However, it was suspected that the hydraulic shutoff valves on this aircraft were leaking. The Flight Manual stated that only 3 full brake applications would be available.

Deficiencies:

The following brake system deficiencies were found:

1. In the event of anti-skid system failure, both normal and emergency brakes were lost until the anti-skid switch was placed in OFF. (SER 10-69-60)

2. With both generators inoperative, normal aircraft braking was lost. This was caused by the design of the landing gear control valve (SER 10-61-53).

REMARKS:

The above test results were based on a very limited evaluation which, aside from the specific tests conducted, primarily consisted of monitoring system operation during Task II. No hydraulic or brake system instrumentation was available and thus results were qualitative in nature. A complete evaluation would include:

1. Instrumentation of critical brake and hydraulic system components
2. Maximum energy brake tests
3. Wet runway brake tests

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Overall Evaluation of the Primary Flight Control System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the primary flight control system.

A-10A TEST RESULTS:

Desirable Features:

1. Normal operation
2. Single hydraulic system operation
3. Emergency disengage system
4. Manual reversion mode (lateral and directional axis)

Deficiencies:

1. High lateral control forces
2. Manual reversion mode (longitudinal axis)
3. Inadequate switchover to manual reversion mode (SER 10-60-52)
4. Other deficiencies included:

SER NUMBER	TITLE
10-16-16	Poor material utilized in flight control structure
10-49-38	Lack of flight control ground lock
10-52-44	Poor access to aileron trim actuator

REMARKS:

The above test results were based on a very limited evaluation. No hydraulic system instrumentation was available. A complete evaluation would include similar tests with critical hydraulic and flight control parameters instrumented.

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AX AIR FORCE EVALUATION TEST RESULTS	
CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Primary Flight Controls - Normal Operation	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy of the primary flight control system during normal operation. The evaluation was primarily based on monitoring system operation during performance, flying qualities and weapons delivery missions.

A-9A TEST RESULTS:

A-10A TEST RESULTS:

The functional adequacy of the primary flight controls system during normal operation was considered satisfactory for mission accomplishment. No major problems with the system were experienced. Elevator and rudder forces were considered good by the pilots. Aileron forces were higher than desirable for weapons delivery. Lateral forces stiffened noticeably during rapid lateral stick inputs. Aileron and rudder trim was considered outstanding. Pitch trim was satisfactory but slightly slow. A qualitative evaluation of the flight controls is presented in the Performance and Flying Qualities Test Report.

REMARKS:

The above test results were based on a limited evaluation which consisted primarily of monitoring system operation during Task II. All systems test results in this area were qualitative in nature. A complete evaluation would include similar tests with critical hydraulic and flight control parameters instrumented.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Primary Flight Controls - One Hydraulic System Inoperative	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy of the primary flight control system with one hydraulic system inoperative. The aircraft was tested in level cruise at 15,000 feet pressure altitude and 200 KIAS with the No. 1 hydraulic system shutdown. The pilot then performed a climb, a dive, left and right hand 2 g turns, 30 degree bank-to-bank rolls and rapid stick inputs in an effort to induce hydraulic pressure fluctuation in the remaining system or flight control transients due to lack of hydraulic power. Normal and emergency trim were also evaluated. The entire test was then repeated with the No. 2 hydraulic system shutdown.

A-10A TEST RESULTS:

The functional adequacy of the primary flight control system with one hydraulic system shutdown was considered satisfactory. Initial shutdown of a hydraulic system resulted in a yaw transient when the yaw SAS disengaged (Secondary Flight Controls - SAS Test Report). Lateral and longitudinal flight control forces and response was very similar to normal operation. However, rudder forces were noticeably increased and rudder authority was reduced by approximately one-half. Both normal and emergency trim operated satisfactorily. No hydraulic power fluctuations were observed on the cockpit gage during any of the test maneuvers.

REMARKS:

The above test results were based on a very limited evaluation (approximately 0.5 hours). All results were qualitative and no hydraulic system instrumentation was available. A complete evaluation would include similar tests with critical hydraulic and flight control parameters instrumented.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Primary Flight Controls - Manual Reversion Mode	SSEB RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy of the manual reversion system. The No. 1 and No. 2 hydraulic systems were shutdown in flight at airspeeds from 150 through 200 KIAS. The pilot then shifted aileron control to DRIVE TAB to achieve lateral axis, manual mode control. Longitudinal and directional axis manual mode control was designed to occur automatically with hydraulic systems shutdown without requiring pilot action. Several maneuvers were then performed including left and right turns, 30 degree bank-to-bank rolls, 2 g to 0 g roller coasters, and landing approaches at altitude. Also, two manual reversion landings were made during Task II. Hydraulic systems shutdown and transition to the manual mode was made with the speed brakes at 20 percent during one test. During another test, transition to the manual mode was made while in a 20 degree dive.

A-10A TEST RESULTS:

Shutdown of the No. 1 and No.2 hydraulic systems resulted in an initial pitch trim change which varied in direction and magnitude. During most tests, maximum pilot effort was required to compensate for the pitch trim change. The magnitude and direction of this change was dependent on several factors including c.g., elevator tab angle, airspeed and power.

Lateral trim changes during entry into the manual mode were not significant; however, lateral control was not available until completing the shift between DRIVE AILERON and DRIVE TAB. This shift took approximately 5 seconds and had several disadvantages (SER 10-60-52). Lateral control in the manual mode was satisfactory. A very small stick deadband was evident. Low but satisfactory roll rates were obtainable with moderate lateral stick forces. Roll rates appeared to be limited by tab authority.

Rudder forces were high and authority was limited. Large pitch force changes were needed during moderate sideslips to correct for changes in elevator tab effectiveness. Directional control was considered satisfactory.

Pitch control was characterized by high forces, a large deadband and an apparent lag in aircraft response. Precision pitch control was very difficult and required maximum pilot attention. Pitch control was grossly affected by power changes. The addition of maximum power was generally not controllable at high airspeeds without the aid of pitch trim even in a forward c.g. configuration. At landing and approach speeds, the pitch up was controllable to approximately 150 KIAS with a forward c.g.; however, control was not available at full power with an aft c.g. Reduction in power to idle produced a nosedown trim change which was less in magnitude but difficult to control. The effects of small power changes at approach speeds were noticeable and produced an immediate increase in elevator forces from trim. Response of the pitch trim provided by the elevator tab was effective in helping to control the excessive forces over a limited airspeed envelope. Trim authority was dependent upon c.g., airspeed, and power. At maximum power with a forward c.g., nosedown trim authority was available to approximately 240 KIAS. With an aft c.g. authority was limited to approximately 125 KIAS. Noseup trim

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A-10A TEST RESULTS CONTINUED:

authority was also dependent upon power, airspeed, and c.g. Airspeed limits were not obtained in each case; however, pitch trim was available for landings at both forward and aft c.g. with power set for moderate descent rates. A qualitative evaluation of manual mode flying qualities is presented in the Performance and Flying Qualities Test report.

No problems were experienced during the manual mode transition with the speed brakes at 20 percent. The shift to the DRIVE TAB position was accomplished normally and flying qualities were very similar to those normally experienced in the manual mode. The emergency speed brake retract was then used to retract the speed brakes.

During the 20 degree dive, 200 KIAS manual mode transition, a large pitch down trim change was experienced. Maximum aft stick force was required to maintain the dive angle and pullout was accomplished using ptich trim. Approximately 2,000 feet were lost between hydraulic failure and completion of the pullout. Additional tests would have to be conducted before any conclusions on pullout recovery in the manual mode could be made.

The lack of an adequate precision pitch control system combined with the large pitch trim changes caused by small power changes made landing very difficult under ideal weather conditions and with maximum pilot attention.

The primary use of the manual control system would be an emergency return to base and landing. The manual control system was satisfactory for cruise control to return to base; however, it was marginal for landing under ideal conditions.

In summary, the primary deficiencies of the manual reversion system were:

1. Extreme pitch changes during transition.
2. Lack of adequate switching (SER 10-60-52).
3. Unsatisfactory pitch trim authority for all c.g.'s. This severely restricted "fly home" airspeed in an aft c.g. configuration. It also severely restricted go-around capability during landing approach with an aft c.g.
4. Marginal longitudinal control for landing.

REMARKS:

The above results were based on a very limited evaluation which consisted of approximately 5 flight hours and two manual reversion landings. A complete evaluation of the manual reversion mode would include:

1. Additional definition of the pitch trim change experienced during transition.
2. Additional tests with the speed brakes extended during transition.
3. Definition of the dive pullout recovery envelope.
4. Additional landing tests including corsswind landings and engine out landings.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Primary Flight Controls - Emergency Disengage System	SSEB RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy of the aileron and elevator emergency disengage system. The right aileron was disengaged while in level flight at 15,000 feet pressure altitude. Typical maneuvers were performed including 30 degree bank-to-bank rolls and 2 g turns. The test was then repeated with the left aileron disengaged. The right and left elevator disengage system was evaluated in a similar manner. All control disengagements were made with the stick in the neutral position. The functional adequacy of the disengage systems was also evaluated with the No. 1 and No. 2 hydraulic systems separately shutdown.

A-10A TEST RESULTS:

The functional adequacy of the aileron and elevator disengage systems was satisfactory. All disengagements and reengagements were easily performed. With one aileron disengaged, a marked decrease in roll rate and slight aircraft buffeting were experienced when rolling into the inoperative aileron. A decrease in lateral stick force and approximately normal roll rates were experienced when rolling away from the inoperative aileron. These differences in roll rate were attirbuted to the large amount of adverse or proverse yaw (respectively) which was associated with a one aileron operation. Overall aircraft control was satisfactory. With one elevator disengaged, slightly lower longitudinal stick forces were experienced with no change in aircraft response. However, although the control cables to one side of the elevator were disengaged, the right and left elevators were still linked together by the carry-through torque tube and asymmetric elevator deflection was not obtained. No significant change in operation of the aileron and elevator disengage systems was noted with either hydraulic system shutdown, although elevator forces increased when the power side was disengaged.

REMARKS:

The above test results were based on a very limited evaluation (approximately 0.7 hours). All results were qualitative. A complete evaluation of the emergency disengagement system would include:

1. Disengagements with the stick deflected from the neutral position.
2. Actual disengagement of one elevator.
3. Simulated jam conditions.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10 Systems Evaluation	DATE;
TEST: Overall Evaluation of Secondary Flight Control System	SSEB RECEIPT: LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the secondary flight control system. The secondary flight control system was composed of the flaps, speed brakes and SAS.

A-10A TEST RESULTS:

Desirable Features:

1. Normal operation
2. Emergency speed brake and flap retraction

Deficiencies:

Deficiencies of the secondary flight control system included:

SER NUMBER	TITLE
10-9-7	Lack of access to speed brake actuator
10-15-20	Undesired flap blow back
10-22-15	Poor location and mode of actuation of flap control
10-41-23	Poor setting arrangement for speed brake switch

REMARKS:

The above test results were based on a very limited evaluation. No hydraulic system instrumentation was available. Individual test reports on each subsystem including the secondary flight controls are attached. A complete evaluation would include similar tests with critical hydraulic and flight control parameters instrumented.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Secondary Flight Controls - Flaps	SSEB RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A flaps during normal and emergency operation.

A-10A TEST RESULTS:

Normal Operation:

Flap extension and retraction were rapid during normal operation, which was a desirable feature since it enabled flaps to be used for improved maneuvering at low speeds. Flap extension to 20 degrees required approximately 3 seconds. Flap retraction was slightly faster.

The aircraft experienced a nosedown trim change during flap extension and a noseup trim change during flap retraction. These changes were very noticeable and objectionable during formation flying.

The flap lever was designed with detents corresponding to the recommended settings for takeoff, landing and various maneuvers. This would have been an outstanding feature allowing precise flap settings without a great deal of pilot attention; however, the lever detents were so poorly defined and calibrated that his feature was unusable during the Task II evaluation (SER 10-22-15).

Differences due to blowback between selected flap position and actual flap position were experienced when the selected flap position was approximately 20 degrees or greater (SER 10-15-20).

Emergency Operation:

The emergency flap retraction system performed satisfactorily, retracting the flaps from 20 degrees to approximately 5 degrees in 10 seconds The emergency retract was tested with the No. 2 nydraulic system and with both hydraulic systems shutdown. The flap blowback protection system that was designed to automatically retract the flaps at approximately 230 knots was not evaluated during Task II.

REMARKS:

The above test results were based on a very limited evaluation which consisted mainly of monitoring system operation during Task II. No hydraulic system instrumentation was available. A complete evaluation would include similar tests with critical hydraulic system parameters instrumented.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Secondary Flight Control System-Speed Brakes	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the speed brakes during normal and emergency operations.

A-10A TEST RESULTS:

Normal Operations:

The functional adequacy and effectiveness of the speed brakes was considered satisfactory. The A-10A speed brakes were very effective drag devices both in-flight and during landing roll. The preselect control was a definite asset, allowing the pilot to preset speed brake setting prior to extension. During weapons delivery missions, the desired speed brake setting would be selected prior to roll-in. Immediately after roll-in, extension of the speed brakes to the preselected setting was accomplished by simply actuating the throttle mounted speed brake switch. This was extremely desirable because pilot attention was not distracted to adjust speed brakes during the critical tracking seconds after roll-in.

The speed brake limiting feature performed satisfactorily, limiting speed brake extension to 80 percent in-flight. Extension to 100 percent was available on the ground.

Slight nosedown and lateral trim changes occurred during speed brake actuation in-flight. The nosedown trim change was the result of too much trim correction in the pitch SAS/speed brake interconnect. The trim correction was made to compensate for the noseup trim change that normally accompanied speed brake extension.

The lateral trim change (rolloff) resulting from speed brake actuation was not predictable in either direction or magnitude. Rolloffs of up to approximately 10 degrees were experienced intermittently throughout Task II. Although the rolloff was easily controlled, it usually resulted in pilot distraction especially during weapons delivery. It also degraded precise formation flying. The rolloff was caused by slight asymmetric opening of the speed brakes. Several attempts to adjust the system were made, however the intermittent rolloff was not eliminated.

Speed brake actuation was relatively fast, which normally would have been good. However, due to the poor design of the speed brake switch on the throttle (SER 10-41-29), the tendency to overshoot the desired setting was increased whenever speed brakes were used without preselecting a desired setting. Additional pilot attention was necessary during these occasions for precise incremental extension.

Emergency Operations:

Operation of the emergency speed brake retract system was satisfactory. Initial actuation of the emergency retract closed the speed brakes from 40 percent extension to 10 percent extension within 5 seconds. The speed brakes then bled slowly into 5 percent extension after some aileron movement, and remained in that position

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A-10A TEST RESULTS CONTINUED:

for several minutes before completely closing. The emergency retract was tested with the No. 1 hydraulic system as well as both hydraulic systems shutdown.

REMARKS:

The above test results were based on a very limited evaluation which consisted mainly of monitoring system operation during Task II. No hydraulic system instrumentation was available. A complete evaluation would include similar tests with critical hydraulic system parameters instrumented.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Secondary Flight Controls - SAS	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the SAS.

A-10A TEST RESULTS:

In general, the SAS system operated satisfactorily during normal operation throughout Task II. It was considered a definite asset especially during tracking maneuvers.

Both pitch and yaw stability augmentation systems were provided. The yaw SAS had a separate channel and engagement switch for each rudder. When power from one hydraulic system was lost, both SAS rudder channels automatically disengaged. This resulted in a yaw transient. In order to reestablish SAS authority on the powered rudder this channel had to be reengaged. If the loss of power from one hydraulic system occurred during rolling or turning maneuvers or during the loss of an engine, this transient probably would be objectionable. The transient could be avoided if loss of one yaw channel did not automatically disengage the other channel. However, this would probably necessitate elimination of the comparison feature between the two channels. A study should be initiated to determine the most desirable mode of operation. A SER will be submitted on the problem.

During the dual generator out test, the right rudder remained in a position of approximately one-quarter rudder deflection while the left rudder remained in the trail position (zero deflection) with the rudder pedals neutral. This resulted in a left skid of approximately 3 degrees. The rudders remained in this configuration throughout the period that the generators were shutdown. The test was repeated and the asymmetric rudder condition did not occur. It was felt that the asymmetric rudder condition was probably caused by the SAS, although positive evidence of this was not obtained. Further investigation should be conducted during Task III to determine the effects of a dual generator failure on the SAS system.

No problems were observed with the pitch SAS. Quantitative information on the SAS system can be obtained from the A-10A Performance and Flying Qualities Report.

REMARKS:

The above test results were based on a very limited evaluation which consisted primarily of monitoring system operation during Task II.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Overall Evaluation of Propulsion System	SSEB RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the propulsion system

A-10A TEST RESULTS:

Desirable Features:

The following areas were considered outstanding or satisfactory and would enhance the aircraft's capability to conduct its design mission:

1. Airstart capability (crossbleed or APU assist)
2. Engine response to throttle bursts/chops (throttle transients)
3. FOD susceptibility
4. Detection susceptibility
5. Engine/M61A1 gun compatibility
6. Flight Operations
7. Ground Operations

Further details on these areas can be found in the attached test reports.

Deficiencies:

The compatability of the YTF34/F5 engines with the A-10A airframe was unacceptable. The susceptibility of the engines to compressor stall and turbine overtemperature at high angles of attack had an adverse effect upon mission effectiveness and safety of flight, and degraded performance. The AEPS (Automatic Engine Protection System) protected the engines from the stall problem; however, the automatic engine rollback and power loss associated with the AEPS was distracting and dangerous. Further details regarding the limitations of the AEPS can be found in the Propulsion - Normal Operation Test Results and in the Performance and Flying Qualities Test Report. Other problems are contained in the following SER's:

SER NUMBER	TITLE
10-1-4	Poor location (too far forward) of throttles
10-2-1	Unacceptable closeness of throttles
10-21-14	Poor location and actuation of throttle friction control
10-25-18	Difficulty in reading and interpreting fan tachometer
10-39-28	Poor grouping of engine instruments
10-66-56	Hot airstarts with throttles forward of idle
10-65-55	Coking of carbureting scrolls

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REMARKS:

The above test results were based on a limited evaluation. Approximately 7 hours of flight time was devoted to propulsion which consisted primarily of airstart and throttle transient tests. The remaining results were based only on monitoring system operation during Task II. Areas which require additional testing include:

1. Airstarts
2. Throttle Transients
3. Engine/Gun campatibility
4. Operation with alternate fuels
5. High engine time

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE; 12 December 1972
TEST: Propulsion - Normal Operations	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

The propulsion system was qualitatively evaluated during normal operation. Particular attention was given to the following areas:

1. Engine/airframe compatibility
2. Engine/M61A1 gun compatibility
3. Ground operations
4. Flight operations
5. FOD susceptibility
6. Detection susceptibility

A-10A TEST RESULTS:

Engine/Airframe Compatibility Test Results:

The compatibility of the YTF34/F5 engine with the A-10A airframe was unacceptable. During the Task I effort it was found that the engines had a tendency to stall and flameout at high angles of attack (AOA) during accelerated maneuvers. An investigation of the problem showed that at high angles of attack excessive turbulence was generated in the fuselage/wing root area. This turbulence was often of sufficient strength to disturb significantly the engine inlet flow field. The disturbances caused insufficient engine airflow and compressor stalls which resulted in interturbine temperatures of up to 1150 degrees C. It was also found that during 1-g stalls at idle power, the engines operated normally even though the angle of attack was high.

To provide a temporary fix for the problem the contractor developed an inlet disturbance detection system. This system consisted of two dynamic pressure ports, one at the six o'clock position below the inlet lip and one inside the inlet. These two pressures were continuously compared. When they differed by a fixed, preset value, indicating an inlet disturbance, a signal was generated which activated the rocket gas ingestion system (RGI) for a minimum period of one second. The RGI system remained activated as long as the disturbance continued. With the RGI system activated, it was found that compressor stalls and the resulting turbine overtemperatures were prevented. The RGI system was installed on the TF34 engine specifically for use with the S-3A aircraft to provide engine protection during rocket firing. The system consisted of several engine protection features. Upon activation, the fuel flow decreased to drive Ng below 80 percent, the compressor inlet variable guide vanes closed down to the low speed condition, and continuous ignition was initiated. Although engine protection was provided, the major disadvantage of the system was the almost immediate power loss associated with RGI activation. The combined inlet detection system and RGI system were called AEPS (Automatic Engine Protection System).

Originally a pitch rate lockout was incorporated into the AEPS to preclude RGI activation during unaccelerated 1-g stalls. With the pitch rate lockout, both a pitch rate signal and the inlet disturbance signal were required for RGI activation. The pitch rate signal was activated when aircraft pitch rate was eight degrees per

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A-10A TEST RESULTS CONTINUED:

second or more as indicated by the SAS gyro. Early in the Task II program, however, it was found that 1-g stalls would cause engine stalls if the engines were operating above idle. During this maneuver the AEPS was prevented from operating due to the lack of the pitch rate signal. The pitch rate signal was not activated due to the low pitch rate associated with 1-g stalls. Thus, it was necessary to incorporate an AOA lockout feature into the AEPS. With this modification, RGI activation would be allowed if the AOA reached 15 degrees and the inlet disturbance signal was present. The other mode of activation was also retained, namely RGI actuation with a pitch rate of 8 degrees per second or above and the inlet disturbance signal.

Another problem with the AEPS which was found early in the Task II program was activation of the AEPS when not required. This was experienced mainly during the weapons delivery missions. This problem was solved by relocating the two dynamic pressure probes to within the engine inlet at the one and five o'clock positions (left engine looking aft). This was the configuration of the AEPS during the majority of Task II. No serious problems with engine stall or premature actuation were experienced with the AEPS in this configuration. However, the AEPS had to be turned off during takeoff and landing in order to prevent AEPS activation and the resultant loss of thrust during these critical phases of flight. With the AEPS off, automatic engine protection was not available and the pilot had to avoid high AOA maneuvers which could cause engine stall. The required on-off switching of the AEPS also increased pilot workload.

The AEPS is considered an unacceptable solution to the engine/airframe compatibility problem for several reasons. First, wing stalls with the A-10A will be a fairly common occurrence. The aircraft operates at angles of attack near the stall to accomplish its mission, and there is very little or no aerodynamic stall warning; therefore, it is anticipated that all three stall modes (accelerated, 1-g above idle power, and 1-g idle power) will be experienced often. Since engine compressor stalls and overtemperatures occurred before or during wing stalls, in many cases the first indication the pilot had that he was in an attitude dangerous to the engines was the activation of the AEPS and immediate loss of thrust. The situation is made even more serious since the aircraft is designed to have its greatest use at low altitudes. The implications for safety of flight are obvious.

Second, the maintainability and reliability characteristics of the AEPS system were largely unknown and failure, degradation, or simply misadjustment of the AEPS could occur. Very sensitive adjustments were required for the AEPS to function properly. Misadjustment could easily result in engine rollback when not required, engine shutdown to avoid overtemperature, severe damage to the engines from overtemperature, or possibly loss of the aircraft if loss of thrust occurred at low altitude. The pilots felt that they had to continually monitor the AOA, normal load factor, and particularly ITT to guard against engine overtemperatures in the event of AEPS failure or misadjustment. This constant monitoring detracted the pilot's attention from the primary requirements of their mission, adversely affecting mission effectiveness. Also, the requirement to turn the AEPS off during takeoff and landing increased pilot workload due to the switching and AOA monitoring required.

Third, the AEPS limited aircraft turning and pullout performance by automatically reducing thrust at high angles of attack. Further details on this aspect of the AEPS can be found in the Performance and Flying Qualities Evaluation Test Report.

The above considerations make the AEPS unacceptable from safety of flight and mission effectiveness standpoints.

The contractor has undertaken an investigation into various aerodynamic solutions to the problem. During Task I these included a fixed leading edge slat in various positions, a fuselage/wing root filet, and various configurations of wing vortex generators and fences. The objective of these possible solutions was to improve the airflow in the wing root area at high angles of attack. Since none of these configurations were evaluated by Air Force pilots, no conclusions can be made. Any proposed solution to the engine/airframe compatibility problem will require a complete flight test evaluation.

Engine/M61A1 Gun Compatibility Test Results:

No specific engine/M61A1 gun compatibility tests were performed. However, engine operation was monitored throughout the gun firing portion of the Task II weapons delivery missions. The compatibility of the M61A1 gun with the YTF34/F5 engine was satisfactory. During the Task II weapons delivery missions, nearly 300 gun firing passes were made at 300 KIAS/45 degrees dive angle and 175 KIAS/15 degrees dive angle. Engine power was at idle during gunnery passes. Engine operation was monitored during gunnery passes and it was found that compressor stalls, flameouts, torching, or other unfavorable conditions resulting from gun firing were not present.

Photographic coverage indicated that approximately two thirds of the gun gas emitted flowed harmlessly under the wing. It was also observed that the remaining third of the gas flowed over the top of the wing and into the engine. Since engine operation was not affected, apparently the gas was sufficiently diluted and cooled prior to engine ingestion. It should be pointed out, however, that much larger quantities of gun gas will be present with the GAU-8 30mm gun system which is being planned for the A-X aircraft. Based on the gas flow patterns observed, engine gas ingestion problems may be present when operating with the GAU-8 gun system.

FOD Susceptibility:

The resistance to foreign object damage (FOD) of the A-10A engine/airframe combination was considered outstanding. The engines were located approximately ten feet above the ground with the inlet sixteen inches above and just forward of the wing trailing edge. In this location the wing shielded the engine from the ground which protected the engine from ingestion of foreign objects. No problem with FOD was experienced during Task I or Task II. It is anticipated that FOD susceptibility will also be low during rough field operations. However, engine ingestion of pieces of broken canopy is a potential hazard in the event the canopy is shattered during air refueling, combat or by a bird strike.

Flight Operations:

In general, the YTF34/F5 engines were easy to operate. Flight operations were considered satisfactory except in the following areas:

1. Poor location of the throttles (SER 10-1-4)
2. Location of throttle friction control (SER 10-21-14)
3. Reading fan tachometer (SER 10-25-18)
4. Grouping of engine instruments (SER 10-39-28).

Details are contained in the cockpit evaluation report. A problem was encountered with the throttles during idle power operation. When the left throttle was at idle, shutting down the right engine could result in also shutting down the left engine (SER 10-2-1). Another discrepancy discovered during Task II was coking of the carbureting scrolls. This problem required a combustor liner inspection every 25 hours of operating time (SER 10-65-55). Some difficulty was also encountered with intermittent illumination of the engine fire warning light when there was no overheat or fire present. Cause of this discrepancy was insufficient securing of a section of the detector circuit element. This allowed the detector element to come into contact with the hot turbine section of the engine. When an additional clamp was provided for the detector elements, no further problem was encountered with the system.

Idle Power Descents:

During Task II, engine operation during an idle power (maximum range) descent from 20,000 to 5,000 feet pressure altitude was investigated. Airspeed was maintained at 170 KIAS and significant engine parameters were continuously monitored during the descent. Engine operation was satisfactory. No rpm rollback, surging, flameout, or other unusual operation was noted.

Ground Operations:

The only specific ground tests performed on the YTF34/F5 engines were engine thrust calibration (trim runs) and a noise level survey. Results of the noise level survey are presented in the PST&E report. Operations were monitored during a variety of ground activities including starting, taxiing, engine trimming, and thrust calibrations. Engine starts were made using the APU, APU plus crossbleed assist, and ground power unit.

All ground operations monitored were satisfactory. Ground starts took significantly longer and were somewhat hotter than airstarts. Typical ground start times (time to idle) for APU starts were 40-60 seconds. Typical inter-turbine temperatures were 580-630 degrees C. APU assisted ground starts were 20-40 seconds faster and approximately 40 degrees C cooler than ground power unit assisted starts.

All pilots remarked that idle thrust was somewhat high for taxiing. The aircraft could easily be controlled during taxi with the speed brakes, nosewheel steering, and wheel brakes; however, the high frequency of brake applications required was objectionable. This situation was usually corrected during post landing taxi by shutting down the right engine and taxiing in with only the left engine operating.

Detection Susceptibility:

Smoke emission of the YTF34/F5 engine was considered satisfactory within the limits of the evaluation conducted during Task II. Exhaust smoke visibility was monitored during ground operations and throughout the weapons delivery missions. Exhaust characteristics were observed both from the ground and from the air and little or no smoke was visible from most of these operations. However, a small amount of smoke was usually visible when the throttles were advanced from idle to maximum power as during pullout from a weapons delivery pass. This was considered acceptable.

Resistance to detection during night operation was outstanding. No exhaust plume or other undesirable characteristics were observed.

Infrared Radiation (IR) Signature:

An evaluation of the IR signature was made at the Naval Weapons Center at China Lake, California. Results will be reported by ASD personnel.

REMARKS:

The above test results were based primarily on monitoring system operations during the Task II evaluation. Areas requiring additional testing are included in the report covering the overall evaluation of the propulsion system and are further expanded in the airstart and throttle transient evaluation reports.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE: 11 December 1972
TEST: Propulsion - Airstarts	SSLB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

Airstarts were accomplished on A-10A S/N 71-1369 and 71-1370. APU-only assisted airstarts without engine crossbleed assistance could not be obtained without shutting down both engines and were not accomplished due to safety considerations. Boost pumps were left on for all airstarts. The airstart tests were divided into four phases. The initial phase was a survey to determine any difference in airstart time as a result of engine cold soak time. These airstarts were performed in level flight at 10,000 feet pressure altitude and 220 KIAS. Crossbleed starts per Flight Manual procedures were initiated at the following points after engine shutdown:

1. As gas generator speed (Ng) decreased through 40 percent rpm
2. As Ng decreased through 20 percent rpm
3. As Ng reached stable windmill rpm
4. One minute after Ng reached stable windmill rpm
5. Five minutes after Ng reached stable windmill rpm

The second phase consisted of crossbleed airstarts during level flight at various airspeeds from Vmax (single engine) to 1.2 Vstall (approach flaps) at 5,000, 10,000, and 15,000 feet pressure altitudes.

The third or maneuvering flight phase consisted of crossbleed airstarts during 2 g turns with the test engine on both the outside and inside of the turn; and skids with the test engine both leading and trailing. Starts were also performed in a simulated weapons delivery pullup and during a sustained idle power descent. All maneuvering starts were performed at 10,000 feet pressure altitude and 220 KIAS.

The fourth phase was an investigation into the windmill airstart characteristics of the engine. Unassisted airstarts were attempted at altitudes and airspeeds within the published windmill airstart envelope. The test engine was shutdown approximately 4,000 feet above the desired start initiation altitude. The pilot then initiated a dive in order to attain the test airspeed. Airstarts were performed in two ways; as Ng decreased through 10 percent rpm (during engine wind down after shutdown), and as Ng increased through 10 percent rpm. Using the latter method, the engine was allowed to wind down to below 10 percent Ng before the dive was initiated. The starts were performed at airspeeds which accelerated the engine to at least 10 percent Ng as specified by the Flight Manual for windmill airstarts.

A-10A TEST RESULTS:

Test results are tabulated in Table I. Figure I is an airspeed/altitude maxtrix showing all Task II airstarts. Figure II is a presentation of all windmill airstarts performed during Task II.

All crossbleed airstart attempts were successful with the exception of one hot start at 162 KIAS and 12,900 feet pressure altitude. For this start the throttle for the operating engine was inadvertently left in IDLE instead of at 85 percent Ng as specified in the Flight Manual. The start was aborted when ITT approached 927 degrees C (start limit) and the engine was later successfully started using the correct setting on the other engine.

Throttle setting during assisted airstarts was critical. Attempts made with the

A-10A TEST RESULTS CONTINUED:

throttle forward of the idle stop resulted in hot starts. This problem was documented in SER 10-66-56.

The initial phase survey showed that increasing the cold soak time for engine assisted starts resulted in:

1. Increased time to lightoff
2. Little or no effect on time to idle
3. Lower peak ITT

The level flight phase tests indicated that a lower airspeed at start initiation resulted in:

1. Little or no effect on time to lightoff
2. No effect on time to idle
3. Higher peak ITT

It was also found during the level flight phase that a lower altitude at start initiation produced:

1. No effect on time to lightoff
2. Shorter time to idle
3. Higher peak ITT

The maneuvering flight phase indicated that climbs, dives, sideslips and turns had essentially no effect on airstart lightoff, time to idle and peak ITT.

The windmill airstart phase of the evaluation showed that windmill starts:

1. Could not be obtained at airspeeds less than 255 KIAS at 10,000 feet without exceeding the 927 degree C ITT limit. This airspeed is approximately 25 KIAS greater than that specified in the windmill airstart envelope presented in the Flight Manual. In addition, the minimum airspeed required for successful airstarts at higher altitudes appeared to be 20 to 30 KIAS greater than that specified in the Flight Manual envelope.
2. Had no effect on time to lightoff
3. Increased time to idle
4. Increase peak ITT
5. Were more likely to be successful if the ITT at start initiation was less than 100 degrees C.
6. Required at least 10 percent Ng at start initiation
7. Required an altitude loss during dive of up to 9,000 feet to attain the speed required for a successful start.

REMARKS:

Time constraints resulting from the limited test time allotted for systems testing during the AFFE prevented this test series from being a complete airstart envelope verification of the A-10A/YTF34 airframe/engine combination. Areas which require additional testing include:

1. Maximum airstart altitude
2. Maximum airstart MACH number
3. Windmilling airstarts at maximum altitude and airspeed
4. Airstart capability with alternate fuels such as JP-5 or JP-8

5. Determination of optimum profile and minimum altitude loss for windmill airstart attempts.

A-10 AIRSTART TEST DATA SUMMARY

Flt.	Maneuver Condition	Pressure Altitude (feet)	Air-Speed (KIAS)	Cold Soak Time (sec)	Engine	Type Start	Ng at Start (%)	ITT at Start (°C)	Time to Lite (sec)	Time to IDLE (sec)	Peak ITT (°C)	COMMENTS
405	LEVEL	5,500	296	17	R	X-Bleed	39	190	1	14		At stable Ng Shutdown at Vmax
405		4,700	223	5:59	L		6	20	7	23	571	5 Min after stable Ng
405		4,850	150	6:11	R		2	58	8	25		
405		4,850	127	6:01	L		1.5	73	3	20	586	
405		4,850	111	5:58	L		2	62	3	25	590	
311		10,500	198	1:04	L		8	91	1	23	565	
405		8,700	242	1:06	L		9	86	1.5	20	777	
405		9,800	216	10	R		32		<1/2	25	677	
405		9,900	213	25	R		18	165	1	20	762	
405		9,700	212	23	L		18	153	1	22	789	
405		9,650	196	1:07	R		9	104	2	21	625	At stable Ng
405		9,850	203	2:11	L		7	83	2.5	21	575	1 min cold soak aft. stable. OAT 13°C
405		9,400	217	5:48	R		0	53	8	28	536	5 min cold soak after stable
405		10,100	197	16	L		7	203	1		800	
40[illegible]		9,700	150	2:11	L		3	100	4	26	590	
304		11,400	145	1:50	L		4	84	2	25	587	Relite after hot start
304		17,100	174	1:53	R		7	97	6	29		Relite after hot start
405		14,900	175	6:12	L		11	64	8	30	537	5 min after stable Ng
405		14,400	143	2:20	R		4	113	8	32	560	1 min after stable Ng

Table I

AFSC (AAFB) 1963 PREVIOUS EDITION OF THIS FORM MAY BE USED.

A-10 AIRSTART TEST DATA SUMMARY

Flt.	Maneuver Condition	Pressure Altitude (feet)	Air-Speed (KIAS)	Cold Soak Time (sec)	Engine	Type Start	Ng at Start (%)	ITT at Start (°C)	Time to Lite (sec)	Time to IDLE (sec)	Peak ITT (°C)	COMMENTS
405	LEVEL	14,700	142	6:09	R	X-Bleed	6	46	10	32	536	5 min after stable Ng
405		14,500	111	2:22	L		1	158	3	30	675	1 min after stable Ng
405		~15,000	~110	~6:00	L		1	110	3	33	~600	No ADAS data
304		17,300	164	2:08	L		6	92	5	30	576	Relite after hot start
410		19,100	166	3:26	L		5	45	6	40	515	Vmax S.E. @ 20K' 1 min after stable Ng
410		19,000	148	4:56	R		4	36	10	41	501	
410	CLIMB	9,900	218	3:10	L		10	21	3	25	562	1 a, Pitch = 11°=3°
304	DIVE	13,300	165	2:50	L		5	110	6	29	560	
410	2 g turn inside	9,500	220	3:04	R		8	37	8	23		OAT = 9.6°C 1 Min after stable Ng
410	2 g turn outside	9,000	220	3:32	L		7	31	4	23	567	
410	Sideslip into	9,900	218	3:25	R		8	33	8	24	543	OAT = 10°C
410	Sideslip away	9,900	220	3:17	L		7	35	4	24	557	OAT = 10°C
304	DIVE	16,100	277	2:30	L	WINDMILL	11	116	5		901	Ng increasing
304		18,300	258	2:21	R		11.5	135		HOT	930	Ng increasing
304		14,900	255	1:48	R		12	123	5	40	909	Ng decreasing
304		18,000	237	1:18	L		12.5	145	3	HOT	937	Ng decreasing
304		12,900	162	2:12	L		5	94		HOT	940	IDLE Assist
304		10,200	268	2:53	R		12	90	8	43	842	Ng increasing
311		12,900	254	5:30	R		10	49	6	49	762	Ng increasing

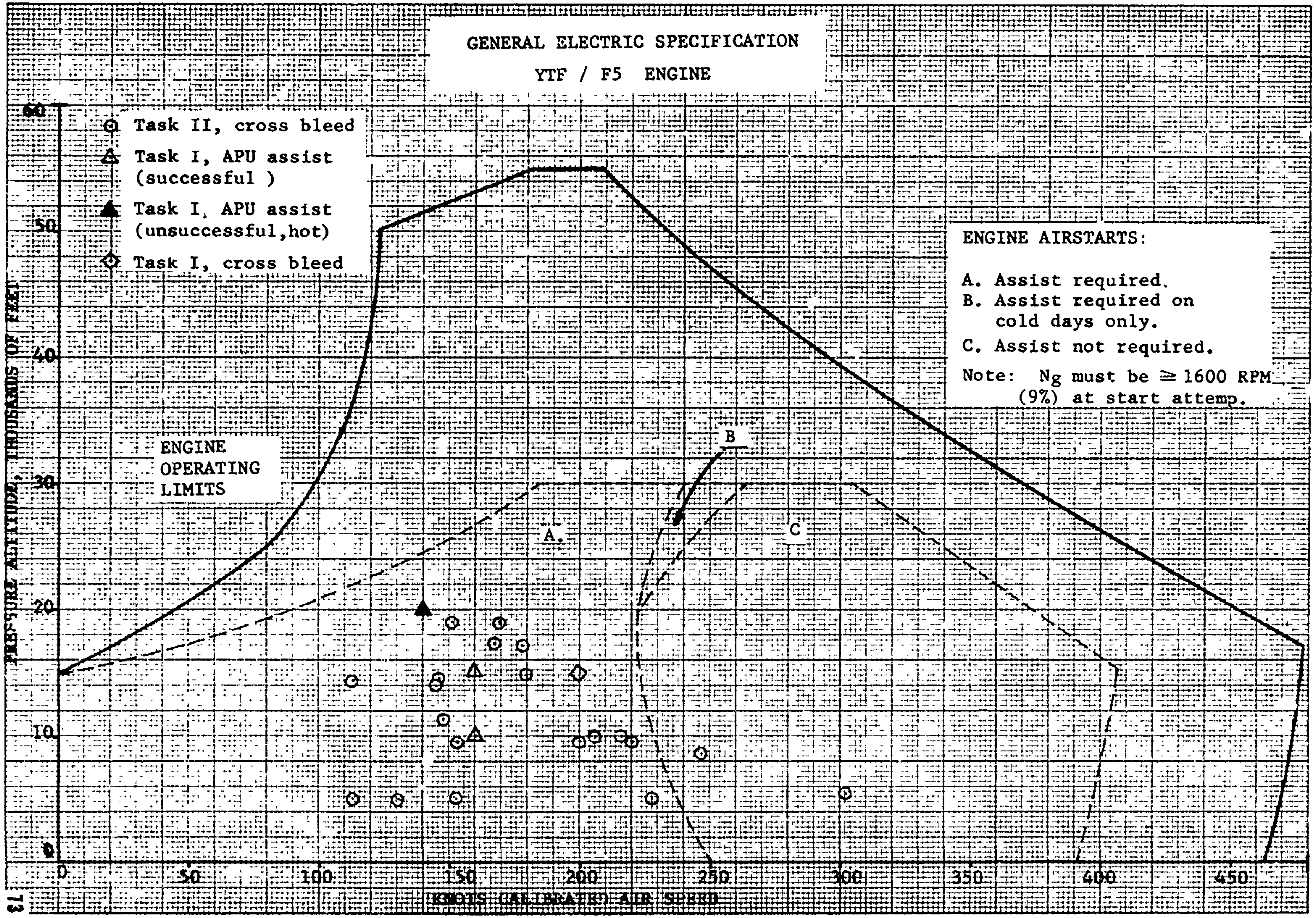
Table I (cont'd)

AFSC (AAFB) 1963 PREVIOUS EDITION OF THIS FORM MAY BE USED.

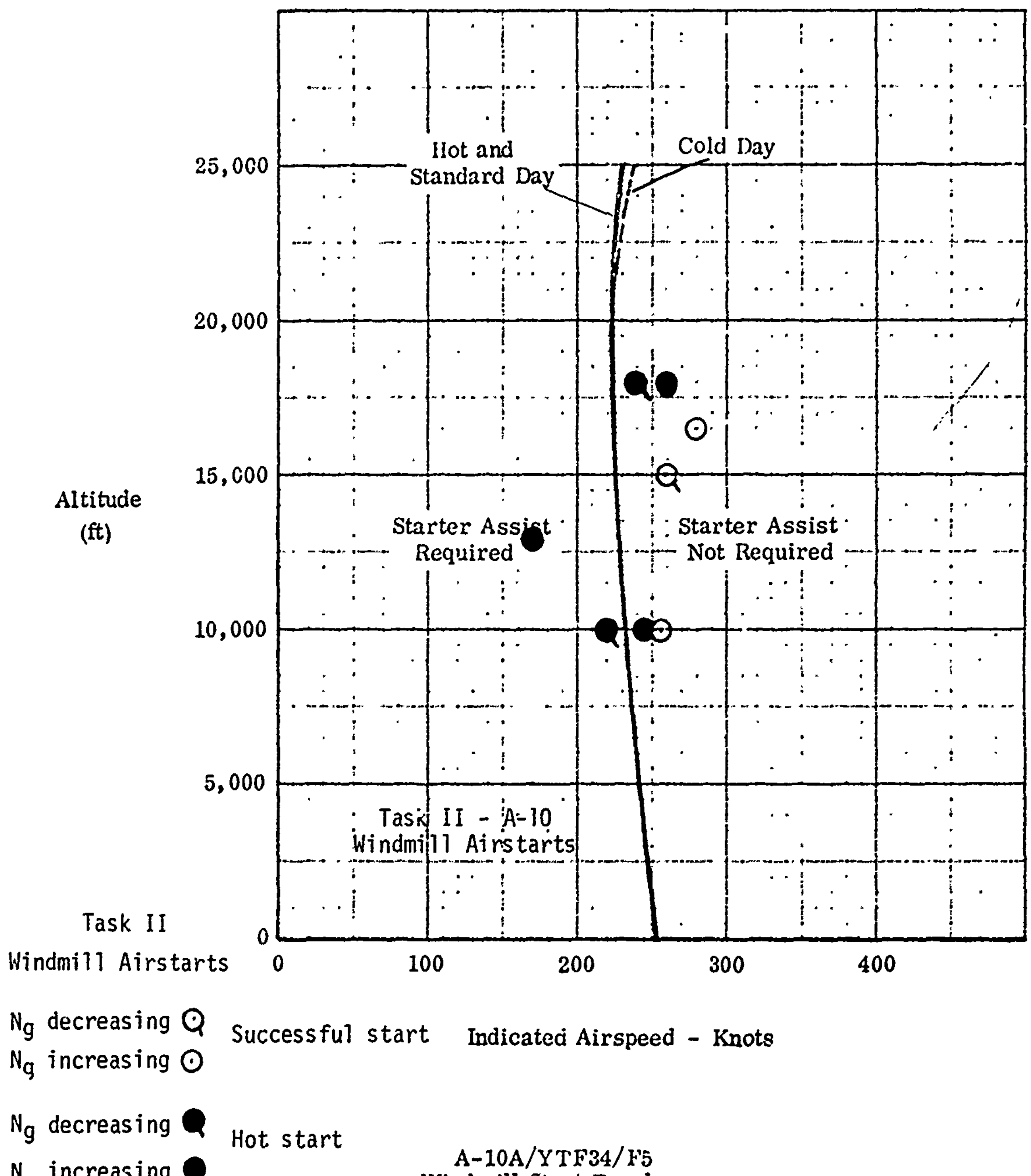
A-10 AIRSTART TEST DATA SUMMARY

Flt.	Maneuver Condition	Pressure Altitude (feet)	Air-Speed (KIAS)	Cold Soak Time (sec)	Engine	Type Start	Ng at Start (%)	ITT at Start (°C)	Time to Lite (sec)	Time to IDLE (sec)	Peak ITT (°C)	COMMENTS
311	DIVE	12,700	238	2:42	L	WINDMILL	8.5	91	5	HOT	935	
405	LEVEL	10,000	200	20	L		22	195	1	HOT	887	Inadvertent
405		9,950	205	23	L		18	151	1	HOT	927	Inadvertent
405		10,000	201	26	L		12	157	1	HOT	904	Inadvertent

Table I (cont'd)



GENERAL ELECTRIC SPECIFICATION
YTF / F5 ENGINE
Task II, cross bleed
Task I, APU assist (successful)
Task I, APU assist (unsuccessful,hot)
Task I, cross bleed
ENGINE AIRSTARTS:
A. Assist required.
B. Assist required on cold days only.
C. Assist not required.
Note: N_g must be ≥ 1600 RPM (9%) at start attemp.
ENGINE OPERATING LIMITS
A.
B
C
PRESSURE ALTITUDE, THOUSANDS OF FEET
KNOTS (CALIBRATED) AIR SPEED
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
450



A-10A/YTF34/F5
Windmill Start Envelope
Note: As per Flight Manual procedures, N_g must be equal to or greater than 10% at start attempt.

Figure II

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A SYSTEMS EVALUATION	DATE:
TEST: Propulsion - Throttle Transients	SSLB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

The objective of the throttle transient evaluation was to determine the effect of rapid power changes on engine operation. The evaluation consisted of throttle bursts ("accels" or rapid throttle movement from idle to maximum power), chops ("decels" or rapid throttle movement from maximum power to idle); and "bodies" (a chop followed immediately by a burst).

The throttle transients were accomplished at 5,000, 10,000 and 20,000 feet pressure altitude and at airspeeds from 150 KIAS to Vmax. Transients were first accomplished in level flight. Transients during maneuvering flight were performed at 10,000 feet pressure altitude and at airspeeds from 170 to 300 KIAS. The maneuvers were:

(1) Turns into and away from the test engine at a medium and high normal load factor.

(2) Skids into and away from the test engine.

(3) Maximum rate climbs simulating a pullup from a weapons delivery pass.

(4) A maximum range idle descent.

All throttle transients were performed with boost pumps on per Flight Manual.

A-10A TEST RESULTS

Table 1 presents the results of throttle transients. Figures 1 through 3 present an airspeed/altitude matrix of all Task II transients.

The results of the throttle transient evaluation showed that:

(1) Time required for Ng stabilization was greater for decels than for accels at all airspeeds, altitudes, and maneuver conditions.

(2) Time required for Ng stabilization was greater for accels than for bodies at all flight conditions.

(3) Time required for Ng stabilization following a decel increased with altitude and airspeed, but was unaffected by high and medium normal load factors.

(4) Time required for Ng stabilization following accels and bodies was unaffected by airspeed, altitude, or maneuver condition.

Engine operation during throttle transients was satisfactory.

Remarks:

This evaluation was a cursory investigation of engine response to rapid throttle movements. Areas which require additional testing include:

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(1) Transients at stall/landing/go-around airspeed

(2) Transients during high altitude maneuvering flight

(3) Transients during gun fire in level flight and high and medium normal load factors.

(4) Transients using alternate fuels such as JP-5 or JP-8

THROTTLE TRANSIENTS

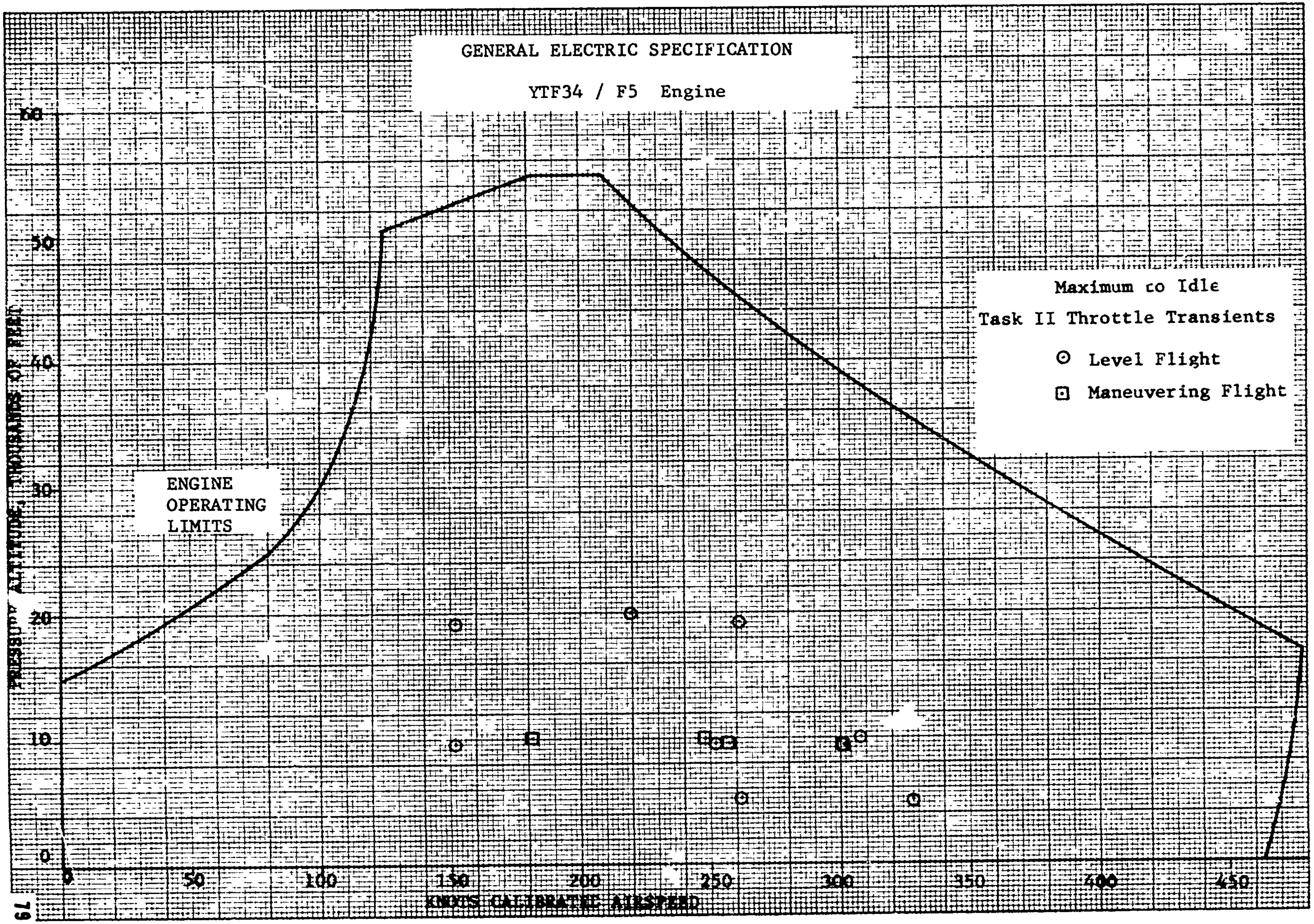
FLT. NO.	PRESSURE ALTITUDE (ft)	AIRSPEED (KIAS)	FLIGHT CONDITION	TYPE TRANSIENT	TIME TO STABLE Nc (sec)	REMARKS
405	9,900	247	LEVEL	M→I	8	
	10,000	230		I→M	4	
	9,800	244		M→I→M	1.5	
	9,700	149		M→I	5	
	9,700			I→M		Data not complete
	9,800	141		M→I→M	1.5	
	10,100	301		M→I	8	Vmax
	10,200	285		I→M	4	
	10,100	284		M→I→M	2	
	5,000	322		M→I	7	Vmax
	4,900	311		I→M	4	
	4,900	306		M→I→M	1.5	
	5,200	257		M→I	7	
	5,300	244		I→M	3.5	
	5,400	241		M→I→M	2.5	
410	9,500	295	4.3 g	M→I	8-9	Incomplete
	8,850	301		I→M	2	
	8,900	301		M→I→M	1	
	9,700	252	3.4 g	M→I	10	
	9,000	229	3.0 g	I→M	4	
	7,400	248	3.7 g	M→I→M	1.5	
	19,300	256	LEVEL	M→I	13	Vmax
	19,100	241		I→M	4	
	18,900	245		M→I→M	1	
	19,200	149		M→I	10	
	19,000	141		I→M→I	4	

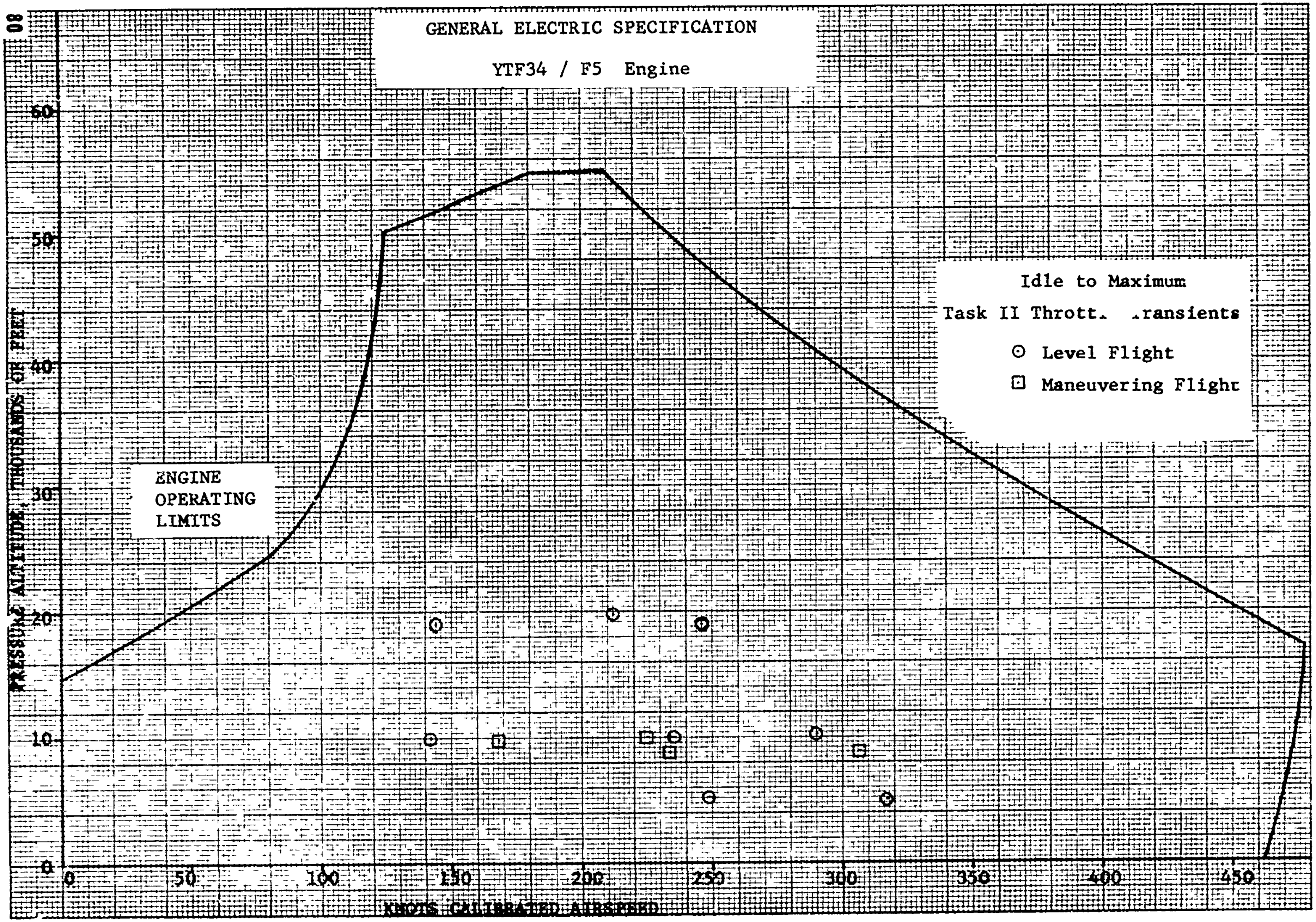
Table 1

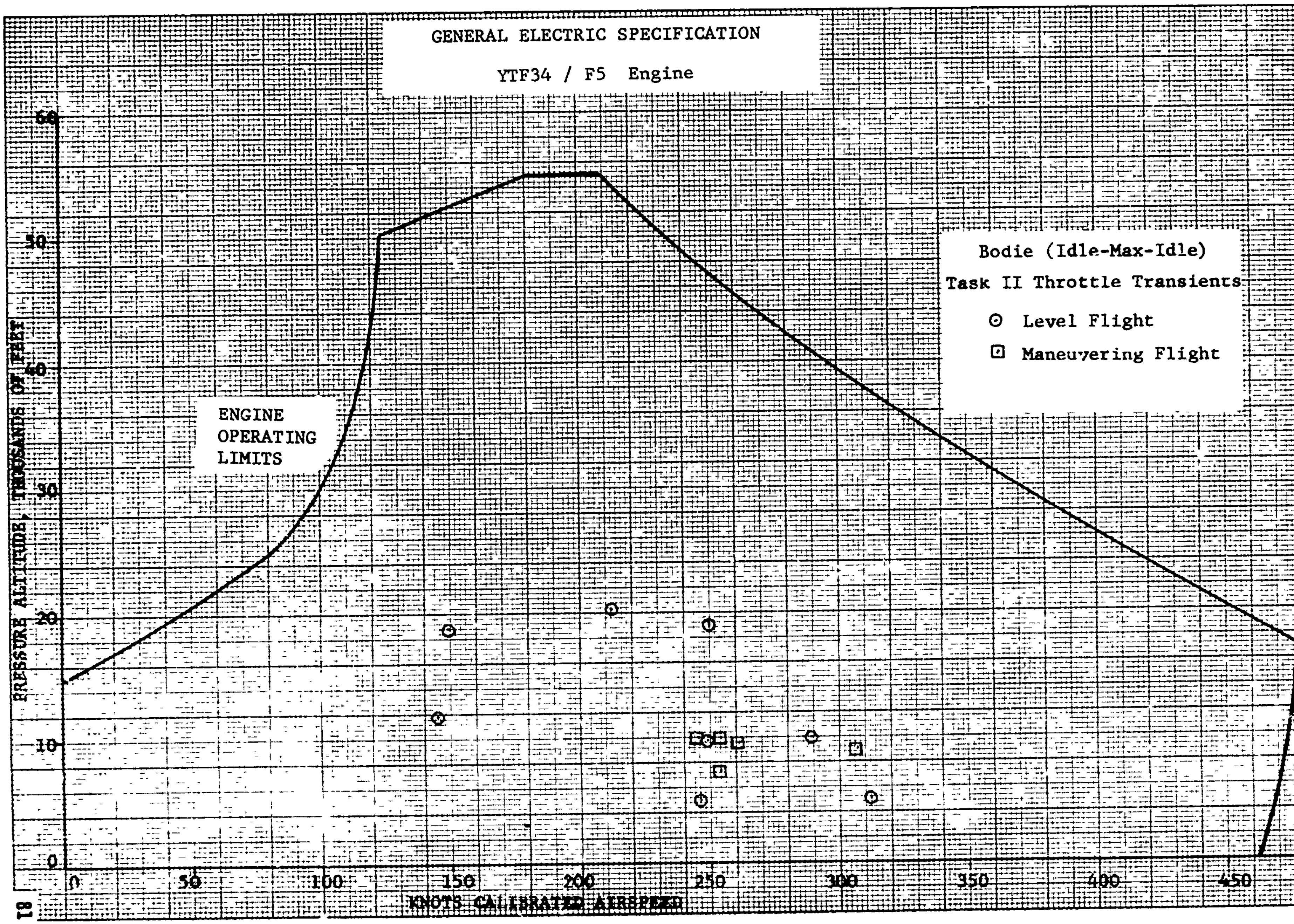
THROTTLE TRANSIENTS

FLT. NO.	PRESSURE ALTITUDE (ft)	AIRSPEED (KIAS)	FLIGHT CONDITION	TYPE TRANSIENT	TIME TO STABLE Nc (sec)	REMARKS
410	18,800	146	LEVEL	M→I→M	1	
304	20,000	215		M→I	11	Data not Complete
	20,000	208		I→M		Data not Complete
	20,100	208		M→I→M		Data not Complete
	9,900	177	DESCENT	M→I	8.5	
	9,800	165		I→M	4	
	9,900	242	SIDESLIP	M→I	10	Away from Engine
	9,900	220		I→M	4	Away from Engine
	10,100	246		M→I→M	1.5	Away from Engine
	10,000	240		M→I→M	2	Into Engine
	9,600	255	CLIMB	M→I→M	2	

Table 1 (cont'd)


GENERAL ELECTRIC SPECIFICATION
YTF34 / F5 Engine
Maximum to Idle
Task II Throttle Transients
Level Flight
Maneuvering Flight
ENGINE OPERATING LIMITS
PRESSURE ALTITUDE, THOUSANDS OF FEET
KNOTS CALIBRATED AIRSPEED
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
450


GENERAL ELECTRIC SPECIFICATION
YTF34 / F5 Engine
Idle to Maximum
Task II Thrott. .ransients
Level Flight
Maneuvering Flight
ENGINE
OPERATING
LIMITS
PRESSURE ALTITUDE, THOUSANDS OF FEET
KNOTS CALIBRATED AIRSPEED
0
10
20
30
40
50
60
80
0
50
100
150
200
250
300
350
400
450


GENERAL ELECTRIC SPECIFICATION
YTF34 / F5 Engine
Bodie (Idle-Max-Idle)
Task II Throttle Transients
Level Flight
Maneuvering Flight
ENGINE
OPERATING
LIMITS
PRESSURE ALTITUDE, THOUSANDS OF FEET
KNOTS CALIBRATED AIRSPEED
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
450

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE: 14 December 1972
TEST: Overall Evaluation of the A-10A Auxiliary Power Unit (APU)	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the APU.

A-10A TEST RESULTS:

Desirable Features: The following areas were considered satisfactory and would contribute to mission effectiveness:

1. Autonomous operation
2. Ground engine starting
3. Source of bleed air for ground cockpit cooling

Further details on the above areas are described in the propulsion system evaluation reports and in the normal operation section of the APU evaluation.

Deficiencies: One potential problem concerned the susceptibility of the APU inlet to dust and dirt ingestion during rough field operation (SER 10-50-39). A second deficiency related to the unacceptable location of the emergency fuel shutoff valve for the APU (SER 10-3-35).

REMARKS:

Time constraints resulting from the limited time allotted for systems testing during the AFFE prevented a complete APU evaluation. No specific tests were conducted on the APU system. Qualitative test results were obtained by monitoring APU operation on the ground and during airborne systems and performance tests. Areas which require additional testing include:

1. APU operation throughout the A-10A airspeed/altitude envelope
2. APU assisted airstarts throughout the airstart envelope
3. ECS efficiency using APU air
4. Capability of supplying the environmental control system requirements for production avionics cooling
5. Adverse weather operation

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE: 14 December 1972
TEST: Auxiliary Power Unit - Normal Operation	SSLB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

The Auxiliary Power Unit evaluation consisted of monitoring normal operation and problem areas, performing ground starts, and qualitatively evaluating the capability of the APU to provide crossbleed air for engine start and ECS operation.

A-10A TEST RESULTS:

The APU was used to supply crossbleed air for approximately one-third of the engine ground starts during Task II. Thus, about 30 engine starts were made with the APU during the AFFE. Normally APU bleed air was used for air-conditioning during preflight taxi and takeoff, and during landing and postflight taxi to the parking area but not during flight.

APU normal operation was satisfactory. It interfaced satisfactorily with the bleed air system and met the requirements of the engine starting system.

In-Flight Operation: APU start times were 20 to 40 seconds. The APU was started only as required to support other operations, such as single engine flying qualities tests, taxi, takeoff, and landing. In many cases, the APU start and shutdown was observed from a safety chase aircraft. No abnormal exhaust smoke or other unsatisfactory operation was observed. The APU was started at altitudes up to 20,000 feet pressure altitude. Increased altitude had little or no effect on APU starting or running.

No APU-only assisted airstarts were performed during Task II. This was due to the inability to isolate the crossbleed feature of the operating engine from the APU. The contractor modified the system and was able to demonstrate one successful APU assisted airstart during Task I, at 10,000 feet pressure altitude and 160 KIAS.

Ground Operation: Engine start times using APU air were 40 to 60 seconds. In all cases the APU provided sufficient air for ground starts. The APU aided ECS operation at low power settings by providing additional bleed air.

REMARKS:

The above test results are based on a limited evaluation. Areas which require additional testing are listed in the APU-Overall Evaluation.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Overall Evaluation of the Environmental Control System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To determine the functional adequacy and effectiveness of the Environmental Control System (ECS). The ECS consisted of:

1. Environmental Control Unit (ECU)
2. Oxygen
3. G-Suit
4. Ram Air Ventilation
5. Gun Compartment Ventilation
6. Ventilation Garment

A-10A TEST RESULTS:

Desirable Features:

1. ECU

The pilots considered the cockpit controls for the ECU easy to operate.

2. Oxygen

The oxygen system had excellent supply characteristics with no surging. The system was nearly trouble free throughout Task II. The maximum duration mission flown was 2.7 hours.

3. Anti-G Suit

The system was considered a definite asset for pilot comfort and fatigue reduction during weapons delivery missions.

4. Ram Air Ventilation

The system provided good ventilation of the cockpit when used. The system would be a definite aid in clearing smoke from the cockpit.

5. Gun Compartment Ventilation

The purge and ram air appeared to be adequate for scavenging gas from the gun breech and gun compartment. The system was simple and reliable.

6. Ventilation Garment

Not evaluated.

Deficiencies:

1. ECU

There were three deficiencies of the ECU. First, adequate cockpit cooling capacity during hot weather, clear day operation, especially during ground operation was doubtful. This is discussed in the attached A-10A Cabin Temperature Survey Report. Since Task II was conducted during the October to December time frame, hot weather operation could not be evaluated to resolve this question. Second, excessive cockpit noise resulted from operation of the system. Pilots reported that noise levels were irritating. Cockpit noise levels with the ECU inoperative were very low and considered excellent. Third, during approximately the first half of Task II the ECU was plagued with intermittent operation. On several flights,

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only hot air could be obtained from the ECU. This discrepancy was also prevalent during Task I. The problem was traced to the ECU controller and control rigging. Corrective maintenance action was taken and the unit performed normally during the final three weeks of Task II. However, this was not considered a thorough evaluation of the fix and further problems may be encountered as more time is accumulated on the system.

2. Oxygen

One discrepancy concerning the location of the oxygen vent tube was documented (SER 10-12-8). This discrepancy reduced the overall rating of the oxygen system to unacceptable due to the safety hazard involved.

3. Anti-G Suit

No deficiencies were noted.

4. Ram Air Ventilation

One discrepancy concerning the ram air ventilation doors was documented (SER 10-32-26). A modification to the doors was made by the contractor during the second half of Task II which consisted of replacing the original hard to use and unsatisfactory latch system with an improved sliding type latch system. Pilots reported that the new system was easy to use and was an acceptable solution to the problem.

5. Gun Compartment Ventilation

Pilots occasionally reported slight traces of gun gas fumes in the cockpit during strafing. No problems resulting from this were noted. Equipment to measure the cockpit toxicity was not available.

6. Ventilation Garment

One deficiency concerning poor access to the ventilation garment blower was documented (SER 10-47-36).

REMARKS:

The above results were based on a very limited evaluation which consisted primarily of monitoring systems operation during Task II. The only instrumentation available consisted of four portable temperature gages which were used during the Cabin Temperature Survey.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10 Systems Test	DATE;
TEST: Cabin Temperature Survey	SSEB RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

Cabin temperatures were measured in selected modes of temperature control system operation during level cruise at pressure altitudes of 5,000 and 20,000 feet. Four gages were taped in the cabin of the aircraft at the locations shown in Figure 1.

Three cockpit temperature control settings were evaluated during a 15 minute period at each altitude. They consisted of the full increase position (initial setting), the full decrease position (second setting), and an intermediate position selected by the pilot which would provide a comfortable cockpit (final setting). Gage readings were taken at one minute intervals for a five minute period at each temperature setting.

Maximum continuous thrust was used during the test at 5,000 feet pressure altitude to simulate low level dash. During the high altitude test, power was adjusted for maximum fuel economy to simulated cross country cruise conditions.

A-10A TEST RESULTS:

Raw data obtained during the temperature survey is presented in the following table. Ground temperature at takeoff was 35 degrees F with no cloud cover.

COCKPIT TEMPERATURE SURVEY

(5,000 FEET)

CONTROL SETTING	ELAPSE TIME (MINUTES)	TEMPERATURE-Deg F GAGE 1	GAGE 2	GAGE 3	GAGE 4
Full Increase	1	61	65	70	65
	2	65	76	80	70
	3	70	90	94	80
	4	80	102	103	85
	5	85	110	110	92
Full Decrease	1	95	105	112	98
	2	90	90	95	90
	3	85	80	82	86
	4	80	75	78	82
	5	80	75	78	80
Normal Cabin	1	78	75	76	75
	2	76	72	73	71
	3	70	70	71	70
	4	64	68	68	66
	5	60	64	67	62
(20,000 FEET)					
Full Increase	1	65	65	85	68
	2	68	82	93	71
	3	71	90	98	76
	4	75	95	100	80
	5	80	98	102	82

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A-10A TEST RESULTS CONTINUED:

Full Decrease	1	80	98	98	82
	2	30	90	88	80
	3	78	82	77	78
	4	75	75	70	75
	5	72	72	65	72
Normal Cabin	1	68	68	68	68
	2	67	67	67	68
	3	64	63	65	66
	4	63	63	65	65
	5	63	62	63	64

Horizontal temperature variation was satisfactory at all of the test points. A maximum of 7 degrees (between gages 1 and 4) was recorded at the end of the five minute period during the low level "Full Hot" test point. Vertical stratification was only significant during the "full hot" test points, reaching a maximum of 25 degrees during the low level test and 20 degrees during the high level test. However, this was not considered to be a probelm since this temperature setting was seldom used in-flight.

The intermediate position (third setting) selected by the pilot was approximately the 8 o'clock position on the control knob. This setting was approximately 30 degrees above the full decrease position. As shown in the table, the cabin temperature continued to decrease during the final five minute period and was approaching stabilization at the end of the period. Vertical and horizontal temperature variation as stabilization temperature was approached was 4 degrees F or less. System response time was good, with cabin temperature change occurring within 2 minutes of switch position change.

ECS operation was considered satisfactory for the flight conditions tested. The temperature ranges available were adequate and temperature variation throughout the cockpit was relatively low. It should be noted that the test flight was flown on a clear day (no cloud cover) during which solar radiation through the canopy probably significantly contributed to cockpit heating. However, considering that the flight was performed on a relatively cool day (35 degrees F ground temperature) and a temperature control knob setting near full decrease was required for a comfortable cockpit, adequate cockpit cooling during hot weather, clear day operation, especially ground operation is doubtful. Qualitative pilot comments, obtained during the Task I Air Force check out flights, indicated that the cockpit was not adequately cooled during ground operation. A comfortable cockpit could not be maintained with the canopy closed. The Air Force check out flights were conducted in the June through September time period during which ground temperatures of up to approximately 110 degrees F were experienced.

REMARKS:

The above results were based on a very limited evaluation (approximately 0.5 hours). The only instrumentation available for the test consisted of four portable temperature gages.

FIGURE I (A)

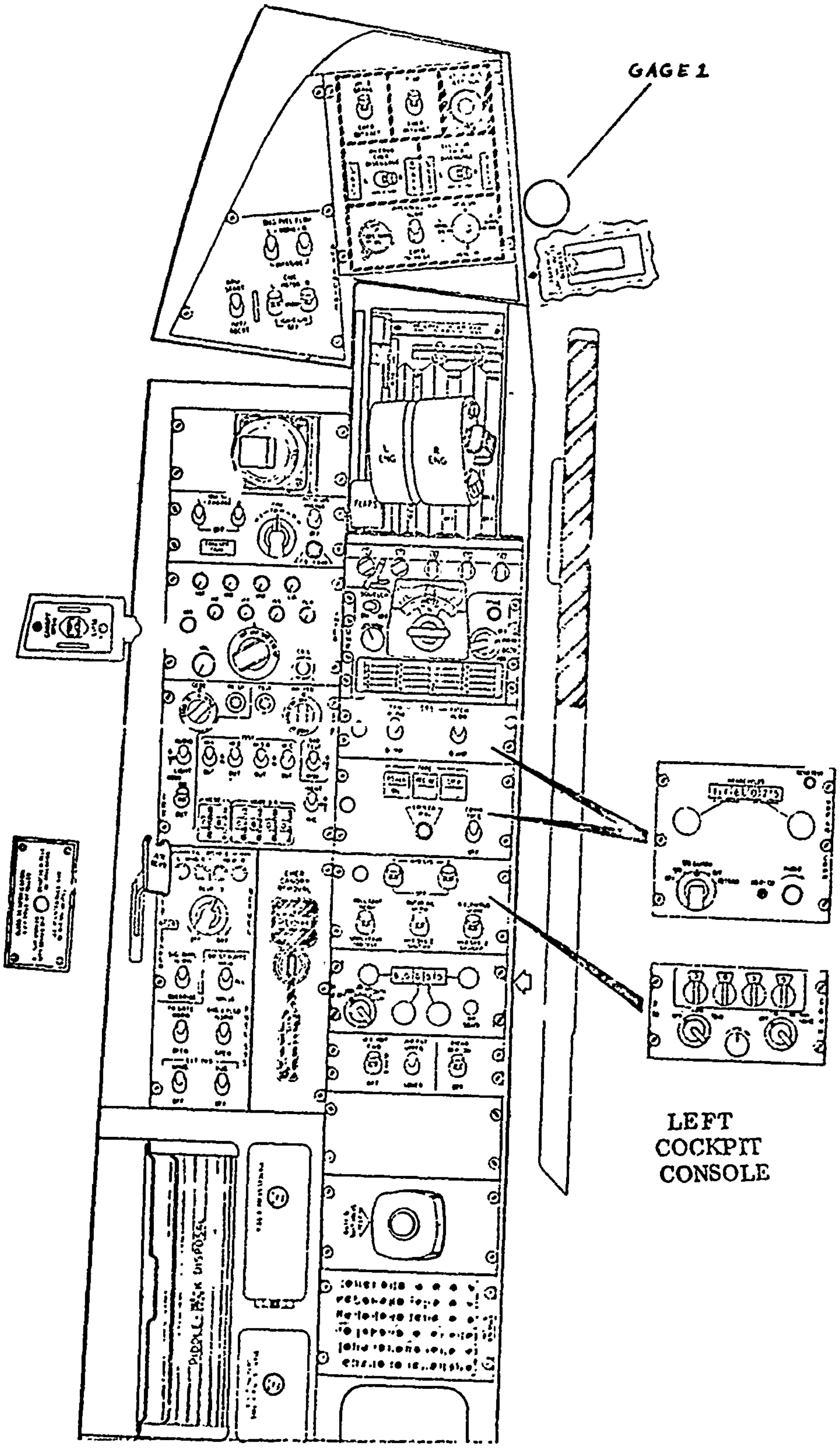
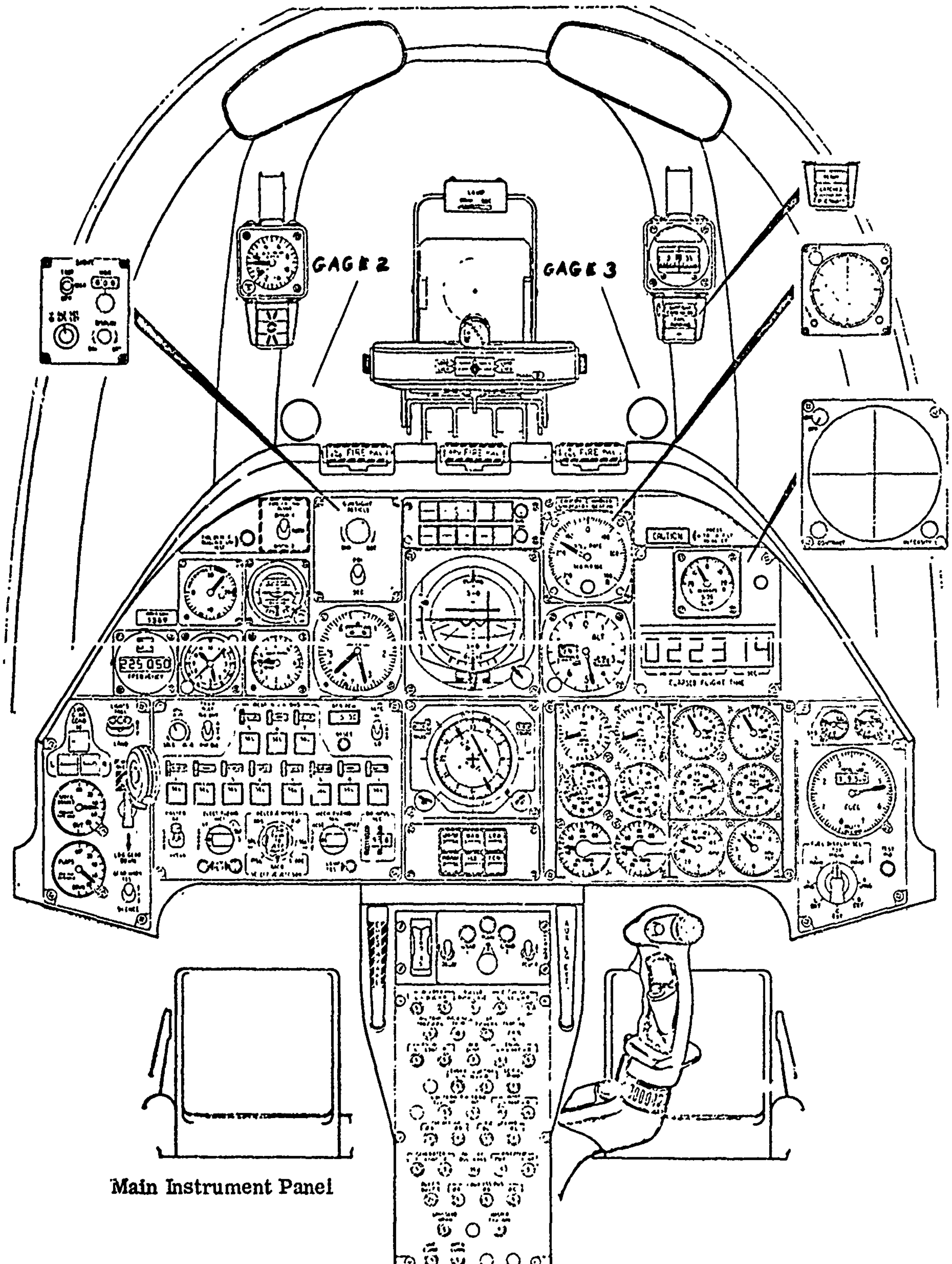
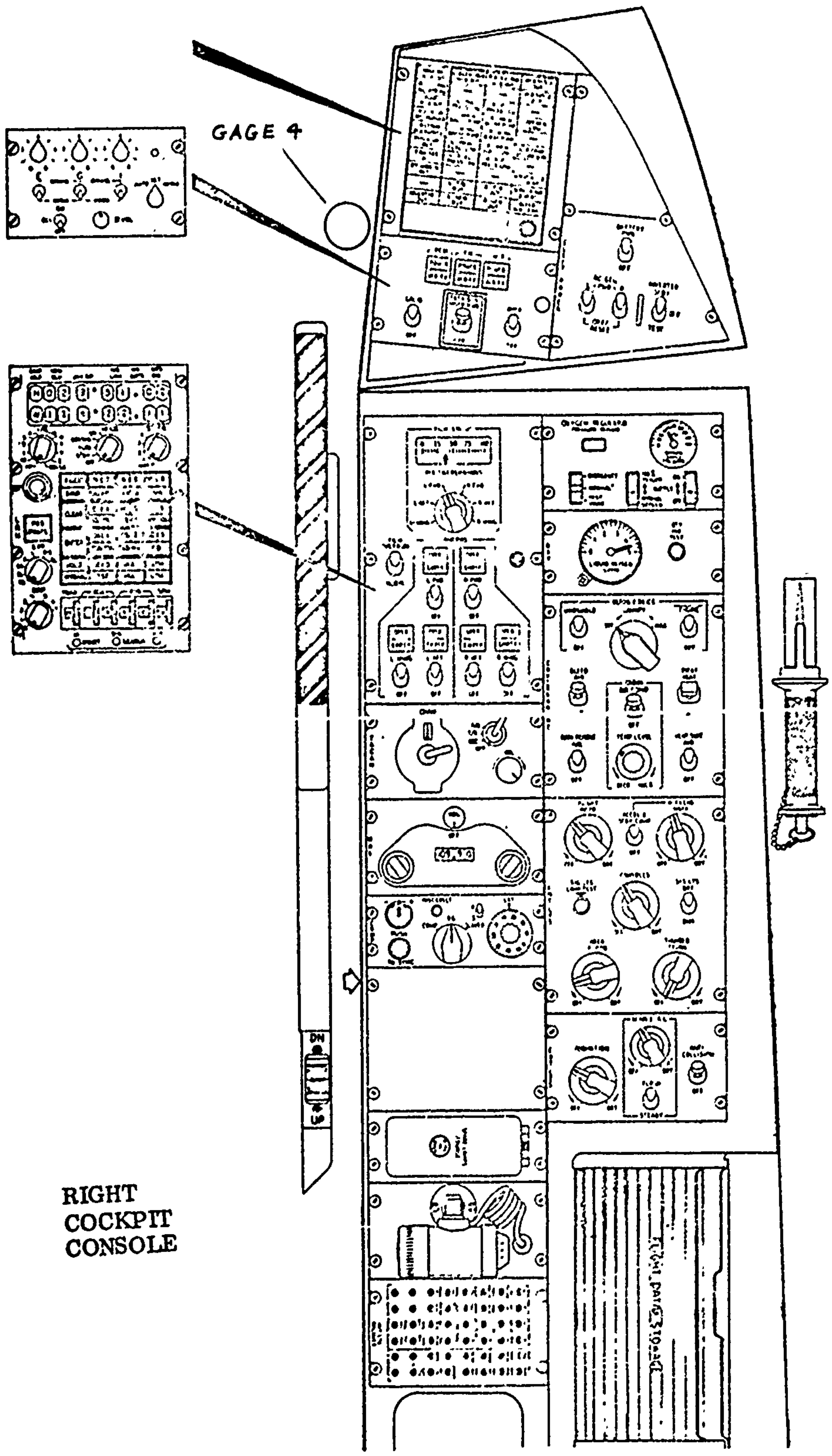


FIGURE I (B)



Main Instrument Panel

FIGURE I (c)



RIGHT
COCKPIT
CONSOLE

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A SYSTEMS EVALUATION	DATE;
TEST: Overall Evaluation of the Electrical Power Supply System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequancy and effectiveness of the electrical system

A-10A TEST RESULTS:

Desirable Features:

The following areas were considered outstanding or satisfactory and would enhance the aircraft's capability to conduct its design mission:

(1) Normal operation

(2) Single generator out operation

(3) Dual generator out operation

Further details on these areas can be found in the attached test result sheets.

Deficiencies:

Electrical system deficiencies were documented in:

SER NUMBER	TITLE
10-8-6	Poor type of electrical connectors
10-10-5	Lack of disconnect provisions on overtemperature sensor wiring of refrigeration package

In addition, during dual generator out operation it was found that normal aircraft braking was lost. This deficiency was caused by the design of the landing gear control valve (SER 10-61-53) and thus was listed as a deficiency of the landing gear system.

REMARKS

The above test results were based on a very limited evaluation and, aside from the specific tests conducted (attached sheets) were based only on monitoring system operations during Task II. No electrical system instrumentation was available, and thus results in this area were based on pilot comments. A complete evaluation would include similiar test with critical electrical system parameters instrumented.

AX AIR FORCE EVALUATION TEST RESULTS	
CATEGORY: A-10A SYSTEMS EVALUATION	DATE:
TEST: Electrical Power. One Generator Inoperative	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

With all electrical equipment except the aircraft external lights operating, first one generator, then the other was cycled off and on to check for electrical power transients and proper operation of the ac bus load transfer system. After this, each generator was cycled rapidly (off-on in 10 seconds) to determine whether power transients could be induced in the system. At this point the generators were individually shutdown and the aircraft flown for 30 minutes on each one to evaluate long range single generator cruise capability. During the single generator cruise tests, speed brakes, flaps, SAS, UHF radio, and internal and external lights were cycled to provide the highest possible power drain during the test.

A-10 TEST RESULTS

No electrical power transients were noticed during the left generator shutdown; however, there was a transient of sufficient size to precess the HSI 100 degrees off heading when the right generator was shutdown. Since no onboard instrumentation was provided to record electrical system data parameters, the magnitude and time span of the transient was unknown. The HSI had to be manually resynchronized; however, the pilot reported no problem in resynchronizing. Another transient ocurred when the right hand generator was turned back on and again the HSI precessed 100 degrees and in addition the HSI "off" flap came up for about 2 seconds. The pilot again manually resynchronized the HSI with no problem. The ac bus load transfer system operated properly, switching the full electrical load to the operating generator whenever a generator was shutdown.

All other electrical equipment operated properly during the 30-minute single generator cruise tests at throttle settings ranging from idle to max power. Based on the above results, single generator operation was considered satisfactory.

Remarks:

The above test results were based on a very limited evaluation. No electrical system instrumentation was available and therefore all results were qualitative in nature.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A SYSTEMS EVALUATION	DATE:
TEST: Electrical Power - Both Generators Inoperative	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

With the aircraft in level cruise at 15,000 feet, 200 KIAS, both ac generators were shutdown, leaving the aircraft with only the battery for electrical power. The instruments powered by the emergency electrical system were checked for proper operation, as were the speed brakes, radio, emergency trim and landing gear. The test series was repeated on the ground during taxi.

A-10A TEST RESULTS:

The instruments powered by the emergency electrical power system included the standby ADI, fuel quantity, hydraulic pressure, oxygen quantity and ITT gages. All operated satisfactorily during the test, as did the UHF radio. The speed brakes were cycled twice and functioned properly. The emergency trim operated satisfactorily. The landing gear system functioned satisfactorily; however, use of the emergency extension handle was necessary to lower the gear. Braking was not available unless the emergency brake handle was pulled (SER 10-61-53). Also an asymetric rudder condition was experienced which is discussed in the Secondary Flight Controls SAS report.

Remarks:

The above test results were based on a very limited evaluation (approximately 1 hour). No electrical system instrumentation was available therefore all results were qualitative and based on pilot comment.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Overall Evaluation of the A-10A Lighting System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A lighting systems.

A-10A TEST RESULTS:

Desirable Features:

1. Excellent overall cabin light control
2. Satisfactory switch and indicator illumination
3. Outstanding UHF remote frequency indicator lighting
4. Satisfactory cabin lighting during complete ac electrical failure

Deficiencies:

The following deficiencies of the lighting system were found:

SER NUMBER	TITLE
10-25-23	Unacceptable armament panel lighting intensity control
10-71-62	Lack of formation lights on forward fuselage.
10-31-25	Poor location of external lights control panel

REMARKS:

The above test results were based on a limited evaluation (approximately 1 hour). No instrumentation was available and all results were qualitative in nature.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Evaluation of the A-10A External Lighting System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A external lighting system during normal and emergency operations.

A-10A TEST RESULTS:

Normal Operation:

The following items were found to be satisfactory and a definite asset to night mission capability:

1. Landing lights
2. Taxi lights
3. Lack of formation light reflection into the cockpit

The tail position light was too bright in the DIM setting. The tail formation lights were outstanding; however, formation lights are needed on the forward fuselage area to provide proper wing references. A SER will be submitted to present these deficiencies in detail.

Emergency Operation:

With both generators inoperative, no external lights were operable. Although this situation was detrimental to night operations, it was considered acceptable due to the nature of the emergency involved. The use of position or landing lights would severly drain the limited supply of battery power available. This power was needed for operation of more critical systems.

REMARKS:

The above test results were based on a very limited evaluation based on a one hour night test flight and landing.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Evaluation of the A-10A Internal Lighting System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A internal lighting system during normal and emergency operation.

A-10A TEST RESULTS:

Normal Operation:

The following items were considered satisfactory or outstanding and a definite asset to night mission capability:

1. Labeling illumination - outstanding
2. Switch illumination - satisfactory
3. Utility light - satisfactory
4. AOA indexer lighting - satisfactory
5. G-indicator and magnetic compass lighting - satisfactory
6. UHF remote frequency indicator dimming control - outstanding
7. Warning light brightness - outstanding
8. Sight lighting control - outstanding

The following intems were annoying to the pilot but were not felt to be detrimental enough to require initiation of a SER:

1. Airspeed indicator dial - too dim
2. Flood light illumination of the center of the front instrument panel - too dim
3. Placement of thunderstorm lights - shadow of pilot's body cast on center of instrument panel
4. "Rachet" type intensity controls - less effective as a vernier light control than "non-rachet" type controls
5. Oxygen regulator and quantity indicator lighting - should be controlled by the console lighting rheostat rather than the engine instrument lighting rheostat
6. Warning light dimming function - controlled by too many switches

The only item deemed detrimental enough for initiation of a SER was the armament panel lighting intensity control (SER 10-25-23).

Emergency Operation:

The following items performed satisfactorily during operation with both generators shutdown:

1. Flight instruments
2. Warning lights and indicators
3. Utility light

No objectionable items were found during internal light operation with both main ac generators failed.

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REMARKS:

The above evaluation was based on a limited evaluation. No instrumentation was available and all results were qualitative in nature.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE: 12 December 1972
TEST: Overall Evaluation of the Hydraulic System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A hydraulic system.

A-10A TEST RESULTS:

Desirable Features:

1. Normal operations
2. Single system operation
3. More than adequate pump size

Deficiencies: A major problem was rapid bleed off of hydraulic pressure after engine loss (SER 10-6-2). Other deficiencies were as follows:

SER NUMBER	TITLE
10-17-12	Inadequate dumping provisions for hydraulic reservoirs
10-23-22	Inadequate size of hydraulic pressure gages

REMARKS:

The above test results were based on a very limited evaluation and, aside from the specific tests conducted were based only on monitoring system operations during Task II. No hydraulic system instrumentation was available, and thus results were qualitative in nature. A complete evaluation would include similar tests with critical hydraulic system parameters instrumented.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE: 12 December 1972
TEST: Hydraulic System - One Hydraulic System Inoperative	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

With the aircraft in level cruise at 15,000 feet pressure altitude, 200 KIAS, and speed brakes extended 40 percent, the No. 1 hydraulic system was shutdown. At this point the speed brakes were retracted using the speed brake emergency retract switch. The pilot then performed a climb, a dive, left and right hand 2-g turns, 30 degree bank-to-bank rolls and rapid stick inputs in an effort to induce hydraulic pressure fluctuation in the remaining system, or flight control transients due to lack of hydraulic power. Normal and emergency trim were evaluated as were the right and left aileron and elevator disengage systems. The entire test, excluding the speed brake retraction, was then repeated with the No. 2 hydraulic system shutdown. The flaps were extended to 20 degrees prior to system shutdown and the emergency flap retract was actuated after system shutdown. Prior to landing, the No. 1 hydraulic system was shutdown again and the landing gear was extended using the emergency landing gear extension handle. During ground taxi emergency braking with the No. 1 system shutdown was evaluated.

A-10A TEST RESULTS:

The emergency speed brake retract system functioned satisfactorily, bringing the speed brakes in slowly to a setting of 10 percent. Banking the aircraft back and forth eventually brought the speed brakes in to a setting of 5 percent, which was considered adequate. No hydraulic power fluctuations were seen by the pilot on the cockpit gage during any of the test maneuvers. The pilot reported flight control forces and response very similar to normal operation, however rudder forces were noticeably increased. Both normal and emergency trim operated satisfactorily. The aileron and elevator disengage system operated normally with one hydraulic system shutdown. Flying characteristics were unchanged from those normally experienced in this mode. The emergency landing gear extension system functioned properly. Landing gear extension time was approximately 30 seconds at 150 KIAS which was considered slow. Emergency braking was available with the emergency brake handle pulled, however anti-skid was not available. The emergency flap retraction system retracted the flaps to approximately 5 degrees almost immediately after actuation. The flaps then bled slowly back to the fullup position. Aircraft control was satisfactory with either hydraulic system shutdown.

REMARKS:

The above test results were based on a very limited (approximately 1 hour) evaluation. No hydraulic system instrumentation was available therefore all results were qualitative and based on pilot comment.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Overall Evaluation of Fuel System	SSEB RECEIPT:
	LOG NUMBER:.

DETAILED TEST CONDITION OR GOAL:

The objective of the fuel system evaluation was to determine the functional adequacy and effectiveness of the fuel system.

A-10A TEST RESULTS:

Desirable Features:

Refueling/defueling; Venting

Deficiencies:

A major deficiency of the fuel system was the location of the left engine emergency fuel shutoff valve (SER 10-3-35).

Other deficiencies which require correction include:

SER NUMBER	TITLE
10-51-40	Inability to correct fuel imbalance
10-4-13	Inadequate fuel quantity indicating system
10-40-34	Unconventional actuation direction of engine crossfeed and tank gate controls

REMARKS:

The above test results were based on a limited evaluation which consisted primarily of monitoring system operations during the Task II evaluation. Areas which require additional testing include:

1. Maximum rate climb with hot or volatile fuel
2. Refueling/defueling rates
3. Air refueling compatibility and envelope determination
4. Additional suction feed tests
5. Compatibility of fuel system with alternate fuels
6. Adverse weather operation

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Fuel System - Normal Operation	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the fuel system during normal operation.

A-10A TEST RESULTS:

Operation of the fuel system was monitored during a variety of ground and flight operations and was considered marginal. One significant problem encountered was the inability on several occasions of the A-10A fuel system to correct a fuel imbalance (SER 10-51-40).

Several problems with the fuel quantity indicating system were encountered. The system was time consuming and difficult to use due to its basic design (SER 10-4-13).

Inaccuracies in the fuel quantity indicating system were also found. The sum of the individual "left main" and "right main" tank readings did not equal the "total main" tank reading. Inaccuracies of up to 500 pounds were noted with the "total main" position selected. Recommendations contained in SER 10-4-13 would delete the "total main" position and eliminate the problem.

Ground operation of the fuel system was satisfactory. The aircraft was easy to refuel with the refueling receptacle in an easily accessible location. A problem with the wing tank fuel shutoff valves was encountered early in the program. When a partial fuel load was desired, incomplete closing of these valves resulted in an unbalanced wing fuel load which could not be corrected. After replacement of the shutoff valves, no further refueling problems were encountered.

REMARKS:

The above test results were based on a very limited evaluation which primarily consisted of monitoring system operation during the Task II evaluation. Additional areas for testing are included in the fuel system overall section of the Fuel System Evaluation.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE: 14 December 1972
TEST: Fuel Tank Calibration	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

The primary objective of this test was to determine fuel tank usable capacity and fuel quantity indicator accuracy.

The aircraft was fueled to maximum capacity and weighed. Fuel meters and scales utilized for the test were calibrated units installed in the AFFTC Weight and Balance facility. The aircraft was defueled in increments of 1,000 pounds, leveled, weighed and all fuel gages read.

A-10A TEST RESULTS:

The aircraft used for the calibration was A-10A S/N 71-1370. Data taken during the fuel calibration is presented in Table I. In order to obtain an accurate calibration, it was necessary for the tanks to be defueled one at a time in the proper sequence. However, faulty fuel shutoff valves allowed fuel to leak back into previously emptied tanks. This can be seen in Table I in the wing tank and main tank columns. This prevented an accurate calibration. More information concerning this discrepancy can be found in the "Normal Operation" section of the Fuel System Evaluation.

Several conclusions can be made concerning this test:

1. From the measured full and empty weights of the aircraft, the total onboard usable fuel quantity was found to be 9,385 pounds.

2. The most accurate quantity indication for total onboard usable fuel was the sum of the four individual tank indications. The maximum error between actual fuel and indicated was 205 pounds at a total fuel weight of 9,385 pounds. This value is within the limits of military specification MIL-G-7940B (2 percent of indicated plus 0.75 percent of full scale). However, at fuel loads of 500 pounds or less this fuel indication showed a positive error of 500 pounds, well outside specification limits.

3. The digital totalizer was outside of specification limits throughout its entire range. Due to the inability to selectively defuel each tank no conclusions can be made about individual tank indicator accuracy or calibrations.

REMARKS:

The above test results were based on a limited evaluation. It is valid as a gross estimate of total fuel capacity and total onboard fuel indicator accuracy. It is not a complete evaluation of the fuel quantity system and will not serve as an accurate fuel calibration. Such as evaluation would include the following:

1. In-shop bench calibration of tank probes and cockpit indicators
2. Refueling/defueling of individual tanks in small increments
3. Refuel/defuel rate measurement

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FUEL CALIBRATION - A-10A

Scale Wt. Diff.	Right(Fwd) Main	Left (Aft) Main	Total Main	Left Wing	Right Wing	Totalizer	4-Tank Total
36,987							
9,385	2,840	2,650	--	2,000	2,100	9,800	9,590
35,975							
8,373	2,550	2,050	--	1,650	2,100	8,700	8,350
35,000							
7,398	2,100	1,150	--	2,000	2,100	7,700	7,350
34,074		BOOST PUMPS RAN					
6,472	2,400	2,500	5,400	590	1,020	6,700	6,510
33,035							
5,433	2,400	2,500	5,400	250	300	5,700	5,450
32,051							
4,449	2,200	2,250	4,900	50	50	4,600	4,550
31,042							
3,440	1,400	1,350	3,150	250	290	3,600	3,290
30,072							
2,470	1,000	950	2,300	240	290	2,700	2,480
29,105							
1,503	750	190	1,300	300	150	1,700	1,390
28,103							
501	0	300	600	450	250	800	1,000
27,602							
0	0	0	200	290	200	400	490

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Fuel System - Emergency Operations	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

One specific test was performed on the fuel system to simulate emergency operation. Both main tank boost pumps were shutdown with the wing tanks empty. In this mode the right engine was required to suction-feed fuel from the right main tank in order to sustain operation. The left engine was fed by a low capacity dc fuel pump which was normally used only to supply fuel during APU and engine starting. In this configuration, the aircraft was put through a series of typical maneuvers. First, an optimum rate of climb from 7,000 to 14,000 feet pressure altitude was performed at approximately 220 KIAS. Next a series of bank-to-bank rolls was conducted at 13,700 feet. The most extreme of these was from -94 degrees to 124 degrees. Three "g" turns to the left and to the right and a dive from 11,800 to 7,900 feet pressure altitude were performed. Airspeed during the dive was 296 KIAS with the engines at idle. Recovery from the dive was made with a 3-g pullout.

A-10A TEST RESULTS:

The only specific test performed was the engine suction feed demonstration during maneuvering flight. The results of this test showed that the aircraft was able to execute a number of different maneuvers with one or two failed boost pumps. No surging, rpm rollback, fuel flow fluctuations or other unsatisfactory operation was noted during the maneuvers.

Emergency fuel system operation was, however, considered unacceptable. This rating was primarily due to a deficiency concerning emergency fuel system operation. Activation of the left engine fire handle cut off fuel to both the left engine and the APU. This feature severly degraded the airstart capability of the right engine (SER 10-3-35).

REMARKS:

The above test results were based on a very limited evaluation. Only one specific test was conducted on emergency fuel system operation during Task II. Additional areas which require testing are included in the Fuel System - Overall Evaluation.

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AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Overall Evaluation of the A-10A Avionics Systems	SSEG RECEIPT: LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A avionics system.

A-10A TEST RESULTS:

UHF Radio:

Desirable Features:

1. Readability and signal strength - satisfactory
2. Compact, one-piece package
3. Low power requirement

Deficiencies:

1. Maximum range slightly below 80 percent LOS (see test for details)

TACAN:

Desirable Features:

1. Maximum range - met 80 percent LOS requirement of MIL-S-25730B
2. Accuracy - satisfactory

Deficiencies: The following SER's were submitted on the TACAN:

SER NUMBER	TITLE
10-53-57	Inadequate identification of TACAN suppressor cables on RT unit
10-54-48	Difficulty in reading TACAN unit indicators
10-58-49	Difficulty in replacing TACAN RT unit

IFF:

Desirable Features:

1. Stand installation - common with other types of aircraft
2. Normal operation - ground interrogation of the IFF was made during most flights as part of air traffic control. Only mode 3 was used. The IFF functioned properly and no problems were experienced.

A-10A TEST RESULTS CONTINUED:

Deficiencies:

IFF antenna location was questionable for air to air interrogation. Both antennas were located on the bottom of the fuselage with one forward and one aft. An IFF antenna was not mounted on the top of the fuselage.

Intercommunications:

Desirable Features:

1. Normal operation - operation was monitored during all tests conducted in Task II. The intercommunication system functioned properly and no problems were encountered.

2. Standard installation - common with other types of aircraft.

3. Simple operation and "Hot Mike" capability.

Deficiencies:

One deficiency of the intercom was poor access to the intercom headset cordage (SER 10-18-21).

Heading-Attitude Reference System (HARS):

Desirable Features: Cockpit location of ADI and HSI.

Deficiencies:

The HARS was unreliable and functionally inadequate throughout most of Task II (SER 10-5-19).

REMARKS:

The above results were based on a limited evaluation. Specific tests were performed to determine maximum range of the UHF radio and TACAN. In-flight attitude variation data were collected on the HARS. The IFF and intercom were monitored only. A complete evaluation of the avionics system would include:

1. Maximum range determination for new equipment or for equipment not installed on the prototype aircraft.

2. Antenna radiation patterns, especially with external stores and with leanding gear or flaps extended.

3. Proper functioning of antenna switching and operation on upper and lower antennas only. This would include measurements of signal strength.

4. Interface with ADF and ILS receivers, if installed.

5. Electromagnetic interference (EMI).

6. Operation in inclement weather or through a cloud cover.

7. Air-to-air communications and interrogation.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: TACAN - Maximum Range and Bearing/DME Accuracy	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

The TACAN evaluation consisted of maximum range and bearing/DME checks and of HI-TACAN instrument approaches. Both prototype A-10A's (SN 71-1369 and 71-1370) were used for the evaluation. Aircraft SN 71-1369 was used for the maximum range test and both aircraft were used for the other parts of the evaluation.

For the maximum range test, the aircraft was flown outbound from Edwards AFB to maximum radio range. DME fixes were taken approximately every 10 NM and compared to prominent landmarks. Two altitudes (10,000 and 20,000 feet AGL with respect to the transmitter) and two frequencies, medium (Edwards TACAN, Channel 68) and high (Palmdale Vortac, Channel 92) were checked. Maximum range was considered to be the point where the TACAN receiver broke lock and would not regain lock-on. Fixes were checked against a TPC sectional chart.

After completing the maximum range checks, a modified 10 NM square pattern was flown at 17,500 feet AGL and 75-80 NM from the Edwards TACAN to evaluate the consistency of the TACAN information displayed to the pilot at the four cardinal aspect angles of the aircraft, i.e., with the transmitter located at a relative bearing of 0, 90, 180 and 270 degrees.

Bearing/DME fixes were taken against TACAN and Vortac transmitters in the Edwards AFB local area. Each fix was taken while overflying a prominent landmark and was checked against a TPC sectional chart.

The published HI-TACAN approach to Edwards AFB was flown and system performance was qualitatively rated by the pilot.

A-10A TEST RESULTS:

Maximum Range:

The observed maximum ranges are tabulated below:

ALTITUDE (ft AGL)	TACAN CHANNEL	MAXIMUM RANGE (NM)	PERCENT LOS
10,000	68	86	70
10,000	92	95 plus	78 plus
20,000	68	134 plus	78 plus
20,000	92	126	72

Military standard MIL-S-25730B requires TACAN maximum range to be 80 percent live-of-sight (LOS). This distance is 98 NM at 10,000 feet AGL, and 137 NM at 20,000 feet AGL. The test was terminated at the ranges marked "plus" because of aicarft maximum radio range limitations. Since these two ranges are within 3 NM of the 80 percent LOS specification requirement, it is reasonable to expect that the system would have satisfied this requirement. The shorter ranges exhibited at the other two conditions were attributed to the mountainous surroundings of the test area. (Owens Valley, with Mt. Whitney to the West, White Mountain to the east and Mt. Langley to the south).

A-10A TEST RESULTS CONTINUED:

Bearing/DME Performance:

Table 1 shows a list of all TACAN fixes taken for the evaluation. All fixes are "TO". In evaluating the results, all bearing errors less than ±2 degrees and DME errors less than ±2 NM were discounted as being within the approximations inherent in the test method.

Of 18 fix points compared, 6 exhibited 3 degrees or more of bearing error. Of these 2 were referenced to approximate landmarks and 2 were obtained from questionalbe bearing lock-ons.

Of 44 fix points compared (same as above plus maximum range data not presented) 7 exhibited 3 NM or more of DME error. Of these 3 were referenced to approximate landmarks and 2 were obtained from questionable DME lock-ons. In general, bearing/DME performance was satisfactory.

Relative Bearing Performance:

Bearing and DME remained relatively stable during the 10 mile square pattern, however a maximum deviation of 3 degrees and 3 NM were observed at a relative bearing of 090 degrees.

Instrument Approach:

The TACAN instrument approach characteristics were satisfactory except in one area. After station passage on the inbound leg over the Edwards TACAN the CDI commanded a 300-400 foot left offset to the runway. This offset amounts to approximately 1/2 degree and may have been an airfield installation characteristic. With this exception, all other bearing, DME, and station location/passage characteristics were considered satisfactory.

REMARKS:

The above test results were based on a limited evaluation. They represent a reasonable estimate of maximum range, however, this will not suffice as a complete evaluation of the TACAN subsystem. No instrumentation was used and the test method used was approximate. The following items are required for a complete evaluation:

1. Complete antenna patterns, especially with armament on board and with the landing gear and flaps extended.

2. Evaluation of proper functioning of antenna switching and of operation on upper and lower antenna only.

3. Operation during inclement weather or through a cloud cover.

4. Electromagnetic interference (EMI).

5. Interface with ILS system.

TABLE I

A-10A TACAN FIX DATA

LANDMARK	TRANSMITTER CHANNEL	AIRCRAFT FIX BRG/DME	MAP FIX BRG/DME	APPARENT ERROR BRG/DME	REMARKS
Edwards TACAN	NID/53	348/43	350/43	2L/0	All Fixes "TO"
Inyokern Airport	LHS/21	197/69	194/69	3R/0	
Inyokern Airport	EDW/68	158/42	156/44	2R/-2	
Inyokern Airport	PMD/92	172/64	172/63	0/-1	
South End of Owens Lake	EDW/68	157/75	156/74	1R/+1	Initial leg of square ptn-0°RB*
Right turn from above	EDW/68	154/72	152/71	2R/+1	First leg 270° RB
	EDW/68	151/77	148/76	3R/+1	Second leg 180° RB
	EDW/68	154/84	151/80	3R/+4	Third leg 090° RB
	EDW/68	156/79	156/77	0/+2	Fourth leg 0° RB
Center of Haiwee Reservoir	LAS/116	--/130	076/134	--/-4	Questionable lock-on
Haiwee Dam	NID/53	139/30	139/30	0/0	
Leach Lake	EDW/68	254/66	219/65	35R/+1	Not Locked on Reference Signal
	LHS/21	225/107	225/108	0/-1	
	BLD/114	060/28	059/90	1R/-62	Questionable lock-on
	VCV/23	194/70	195/69	1L/+1	
	EDW/68	218/64	219/65	1R/-1	
	LHS/21	227/103	225/108	2R/-5	
	VCV/23	192/63	195/69	3L/-6	

NOTE: *-Relative Bearing

AFSC FORM JUL 61 185 a GENERAL PURPOSE WORKSHEET AFSC-AAFB-WASH.,D.C

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: UHF Communications-Maximum Range and Readability	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

The UHF communications evaluation consisted of maximum range, readability and signal strength checks. The test was conducted with A-10A SN 71-1369, which was equipped with an AN/ARC-150 radio set rated at 10 watts RF output. Three frequencies within the available radio band were used. They included a low (260.7 MHz), medium (314.4 MHz) and high (383.0 MHz) frequency. The test altitude were 10,000 and 20,000 feet AGL with respect to the ground station. Radio contact was maintained with the contractor's ground station, which used an AN/ARC-51BX.

The aircraft was flown outbound from Edwards AFB to maximum outbound radio range as determined by readability and signal strength. It was then flown approximately 10 NM beyond the maximum outbound range before turning back toward the ground station to determine maximum inbound radio range. Aircraft location was checked against prominent landmarks and TACAN DME. Readability and signal strength were rated according to the following key:

Audio Readability

1. Unreadable
2. Barely readable; occasional words missing
3. Readable, but occasionally difficult
4. Readable with no difficulty
5. Perfectly readable

Signal Strength

1. Faint to very weak
2. Weak to fair
3. Fair to good
4. Good to moderately strong
5. Strong to extremely strong

After completing the maximum radio range checks, a modified 10 NM square pattern was flown at 17,500 feet AGL and 75-80 NM from the ground station to evaluate consistency of readability and signal strength at the four cardinal aspect angles of the aircraft, i.e., so that the ground station was positioned at 0, 90, 180, and 270 degrees with respect to the aircraft. A radio transmission was made during each turn and while flying wings level on each leg.

A-10A TEST RESULTS:

Maximum Range:

The observed maximum ranges are tabulated below:

A-10A TEST RESULTS CONTINUED:

Altitude (ft AGL)	Frequency(MHz)	Maximum Inbound Range (NM)	Maximum Outbound Range (NM)
10,000	260.7	87-88	89-90
10,000	314.4	87-88	87-88
10,000	383.0	88-90	88-90
20,000	260.7	121-122	Not Det
20,000	314.4	117-118	129-130
20,000	383.0	Not Det	127-128

Typical UHF maximum range performance for air to ground is approximately 80 percent line-of-sight. This is 98 NM at 10,000 feet AGL and 137 NM at 20,000 feet AGL. Since the performance of the A-10A UHF was approximately 90 percent of typical, the range was considered marginal. The pilot reported approximately the same results as the ground station.

Relative Bearing Performance:

The signal strength and readability were consistent for all four relative bearings checked during the 10 mile square pattern. The received signal was stable regardless of airplane attitude. The pilot reported approximately the same results at the ground station.

REMARKS:

Since the A-10A was not equipped with an automatic antenna switching system, the lower antenna mode was used. Time restrictions and priorities prevented evaluation of the upper antenna.

The above test results were based on a very limited evaluation (approximately 2 hours). They are valid as an approximate measure of maximum range; however, they do not represent a complete evaluation of the UHF radio. The following items are required for a complete evaluation:

1. Operation during inclement weather or through a cloud cover

2. Complete antenna radiation patterns, especially with armament onboard and with landing gear and flaps extended. This would include measuring signal strength.

3. Evaluation of proper functioning of antenna switching and of operation on upper or lower antenna only.

4. Interface with ADF receivers.

5. Electromagnetic interference (EMI).

6. Air-to-air communications.

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE:
TEST: HARS - Normal Operation	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

Data was taken by pilots in a limited number of weapons delivery flights near the end of Task II. Attitude and heading indication were recording while in a level attitude at 200 KIAS during the following phase of flight:

1. Before takeoff
2. After takeoff
3. After the second bomb pass
4. After the twelfth bomb pass
5. After the twenty-fourth bomb pass
6. While returning to base
7. After landing

A-10A TEST RESULTS:

The ADI in-flight data are shown in Table I.

Attitude data were reliable until bombing passes were made. On the average, a noticeable attitude error (5-10 degrees pitch and 4-10 degrees roll) had occurred by the twelfth (12) bomb pass. This was, on the average, the maximum error, however the error persisted throughout the remainder of the mission. The error usually decreased during level flight back to base, but was still unacceptable in approximately half of the mission checked.

In addition of the earth rate correction during the last two weeks of the Task II program significantly improved the reliability of the pitch indication, but had no effect on the roll indication.

The HARS was unacceptable as used during most of the Task II program.

REMARKS:

The above results are based on a limited evaluation. No instrumentation was used and all data presented were hand recorded based on pilot judgement of indicator errors encountered. A complete evaluation would include:

1. Complete in-shop function check and adjustment of system components
2. Complete in-flight evaluation with instrumentation

TABLE I

A-10A ATTITUDE DIRECTOR INDICATOR DATA

FLIGHT	BEFORE TAKEOFF		AFTER TAKEOFF		AFTER 2nd BOMB PASS		AFTER 12th BOMB PASS		AFTER 24th BOMB PASS		WHILE RETURN TO BASE		AFTER LANDING		REMARKS
	Pitch (deg)	Roll (deg)	Pitch (deg)	Roll (deg)	Pitch (deg)	Roll (deg)	Pitch (deg)	Roll (deg)	Pitch (deg)	Roll (deg)	Pitch (deg)	Roll (deg)	Pitch (deg)	Roll (deg)	
3-14-123	0	0	0	0	5 up	5 R	5 up	0	10 up	0	10 up	5 R	0 / 7DN	8R / 0	
3-15-124	0	0	0	0	2 up	2 L	10 up	10 L	---	---	10 up	10 L	5 up	5 L	
3-16-125	0	0	0	0	3 up	3 L	3 up	3 L	3 up	3 L	4 up	4 R	3 up	3 L	
4-38-79	0	0	0	0	0	0	0	5 R	0	5 R	0	5 R	0	0	
4-39-80	0	0	0	0	5 up	0	5 up	10 L	10 up	20 L	10 up	20 L	5 up	10 L	
3-17-126	0	0	0	0	6 up	0	---	---	---	---	---	---	---	---	Air Abort
3-18-127	0	0	0	0	0	0	---	---	0	2 R	---	---	7 DN	2 R	16 Bomb Passes
3-19-128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3-20-129	0	0	0	0	2 up	2 L	5 up	4 L	---	---	2 up	2 L	0	0	
4-53-95	0	0	0	0	0	0	0	3 R	0	0	0	0	0	0	*
4-54-96	0	0	2 up	0	2 up	0	2 up	0	2 up	0	2 up	0	2 up	0	*
4-55-97	0	0	0	0	0	0	0	3 L	0	5 L	0	3 L	0	3 L	*
4-57-99	0	0	0	0	0	0	0	8 L	0	6 L	0	3 L	0	3 L	*

* Earth rate correction incorporated

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: Overalll Evaluation of the Armament System	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the A-10A armament system.

A-10A TEST RESULTS:

Desirable Features:

1. Stores suspension system.
2. M61A1 gun system/aircraft compatibility (It is unknown what the impact will be with the GAU-8 gun system).

Deficiencies: Deficiencies of the armament system were:

SER NUMBER	TITLE
10-67-58	Inadequate access to bomb rack electrical connectors in pylon stations 3, 4, 7, 8, and 9
10-68-59	Lack of access panels on wing stations pylons 1 and 11

REMARKS:

The above test results were based only on monitoring systems operation during the Task II evaluation. Listings of areas required for a complete evaluation are included in the attached reports.

AFFTC Form 0-592 (One Time) Oct 72 Expires 31 Dec 1972

AX AIR FORCE EVALUATION TEST RESULTS	
CATEGORY: A-10A Systems Evaluation	DATE:
TEST: M61A1 Gun System/Aircraft Compatibility	SSEB RECEIPT: LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To determine the compatibility between the aircraft and the M61A1 gun system and relate this to the GAU-8 gun system which is being considered for use in the A-X aircraft.

A-10A TEST RESULTS:

Based on observations made during approximately 250 firings of 60 rounds duration, the gun/aircraft compatibility was determined to be satisfactory. The gun operated with little vibration and the noise level in the cockpit was relatively low. No structural problems were observed. Traces of gun gas were occasionally noted in the cockpit, however this was not a problem. The concentration of the gas was not determined due to unavailability of the necessary equipment.

Photographic data showed that approximately two-thirds of the emitted gun gas flowed harmlessly under the wing. However, the remaining third of the gas flowed over the wing and into the engine. Apparently the gas was sufficiently cooled and diluted before entering the engine since engine performance was not noticeably affected. It should be pointed out that larger quantities of gas will be emitted by the GAU-8 gun and engine gas ingestion problems may be present with the GAU-8 gun system.

REMARKS:

In order to conduct a complete evaluation of the GAU-8 gun installation, instrumentation would be needed for acquiring and recording data on at least the following factors:

1. Gun bay pressurization.
2. Vibration induced into aircraft structure through gun mounts.
3. Reaction forces at gun mounts.
4. Amount of gun gas in cockpit.
5. Effect of gun gas ingestion on engine performance.

The gun should be evaluated throughout the entire performance envelope of the aircraft. More than one firing rate should be evaluated, if possible. The boresighting procedure and the interface of the gun with peripheral equipment should be evaluated.

AX AIR FORCE EVALUATION TEST RESULTS	
CATEGORY: A-10A Systems Evaluation	DATE:
TEST: Store Suspension and Release	SSEB RECEIPT: LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

To evaluate the functional adequacy and effectiveness of the store suspension and release system during normal operations.

A-10A TEST RESULTS:

Based on observations made during the weapons delivery missions the stores suspension and release system was determined to be outstanding. Stations were so located that stations 1 through 4 and 8 through 11 were partially visible from the cockpit. This tended to simplify stores management for the pilot. MK-82 bombs did not require forced ejection from any of the stations when carried singly. An intermittent problem was encountered on aircraft SN 71-1369 wherein the weapons suspended from station 4 would not release normally during three missions. The problem was traced to a defective electrical relay. The relay was replaced and no further trouble was experienced.

REMARKS:

Only MK-82, BLU-1, and BDU-33 bombs were evaluated during the weapons delivery portion of the A-X program. A complete evaluation of the stores suspension and release system would require carriage, separation, and delivery testing with a wide assortment of types of stores typical of the A-X mission. Weapons would be carried in all configurations and released in all modes typical of the A-X mission. These evaluations would be conducted at selected airspeeds and altitudes within the performance envelope of the aircraft.

AFFTC Form 0-592 (One Time) Oct 72 Expires 31 Dec 1972

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE;
TEST: A-10A Propulsion - Engine/Airframe Compatibility	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

Tests were conducted after completion of Task II to evaluate contractor modification of the A-10A airframe as a solution to the YTF34 engine/A-10A airframe incompatibility problem. This deficiency was documented in the Propulsion-Normal Operations section of the Systems Evaluation Test Results. The modifications consisted of several aerodynamic changes to the A-10A airframe. A fixed, single slotted leading edge slat was installed on the inboard section of each wing between the fuselage and the main landing gear pod. A 24 inch wing leading edge stall strip was located approximately one and a half feet outboard of each gear pod. Also, a filet between the wing and the fuselage at the aft wing root was added. Lastly, a vertical strake was mounted on the fuselage forward of and just below each wing. The complete configuration is shown in Figure 1.

The maneuvers used to evaluate the contractor's modification were 1-g stalls at idle power, 1-g stalls at above idel power, and accelerated stalls.

Unaccelerated stalls were performed at 10,000, 20,000 and 25,000 feet pressure altitude. During the stalls the throttles were set at various positions from idle to maximum. Stalls were performed in both the gear and flaps up and gear and flaps down configurations. Both light and heavy gross weights (18 MK-82 Configuration) were tested.

To investigate engine operation during accelerated stalls, windup turns to airframe buffet were performed. The normal load factor limit of 5.86 g was observed. Windup turns were accomplished at 10,000, 20,000 and 25,000 feet pressure altitude, and at speeds from 140 to 300 KIAS. Both light and heavy gross weights were evaluated. During the 1 -g and accelerated stalls, the aircraft was held in buffet for a sustained period, normally 5 to 10 seconds.

A complete listing of test maneuvers accomplished during this evaluation can be found in the Performance and Flying Qualities Evaluation Test Report.

During the evaluation the rocket gas ingestion (RGI) system was deactivated. However, Automatic Engine Protection System (AEPS) equipment remained installed on the aircraft. Instrumentation was provided which indicated when the system would have rolled back the engines had it been activated.

A-10A TEST RESULTS:

Engine operation during all maneuvers performed during the evaluation was satisfactory. Inlet instrumentation indicated that a small degree of inlet disturbance was experienced by the engines during all maneuvers performed. These disturbances were slightly greater during tests in the heavy gross weight configuration. Inlet flow distortion was occasionally of sufficient strength to cause the AEPS switch to actuate intermittently. However, the engines showed no compressor stall, overtemperature, or rollback tendencies.

Additional test results can be found in the Performance and Flying Qualities Evaluation Test Report.

REMARKS:

The above test results were based on a very limited evaluation which consisted of approximately 3 hours flight time. A complete evaluation would include similar maneuvers throughout the loading and flight envelope of the aircraft.

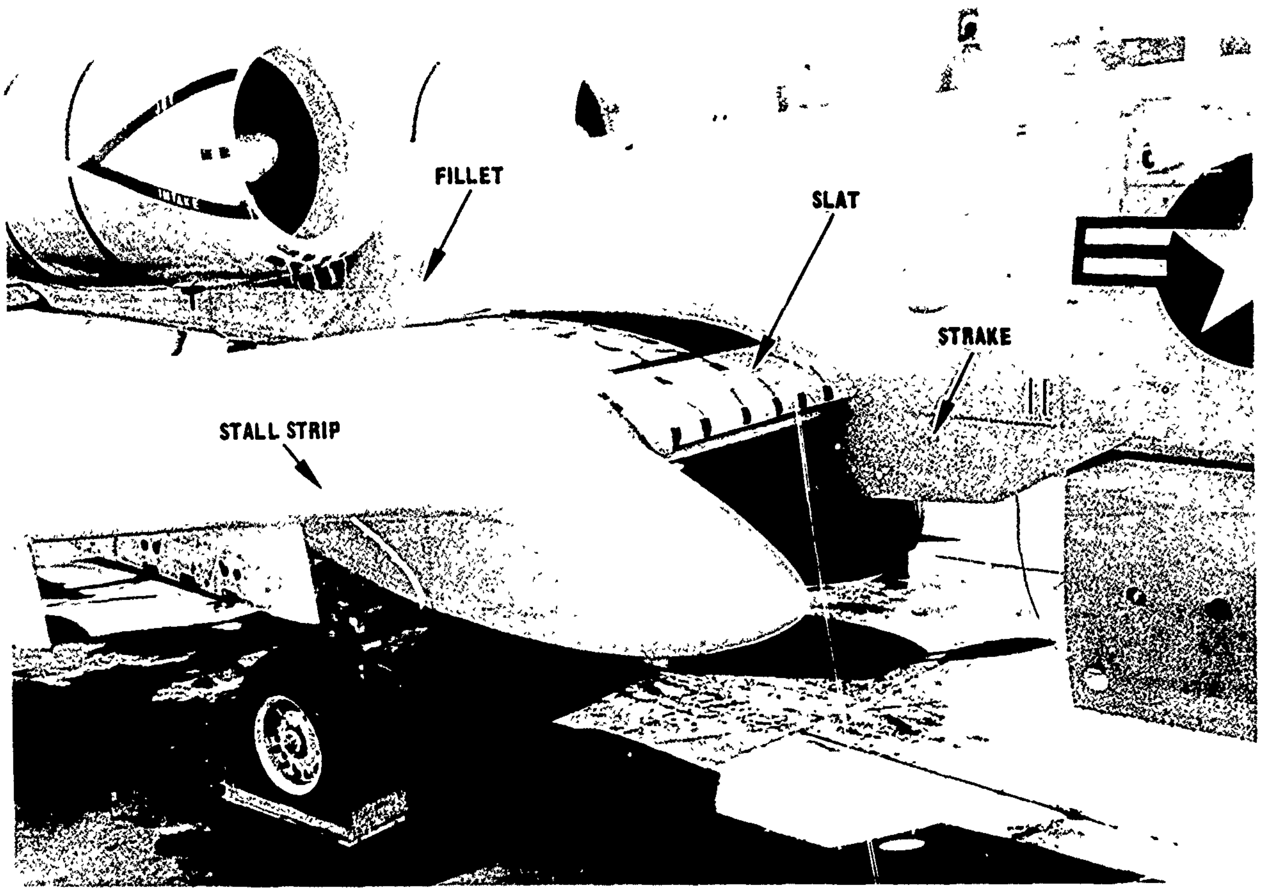

Figure 1

APPENDIX III
SYSTEM EVALUATION REPORTS

Timely and proper identification of aircraft deficiencies was of primary importance within the A-X JTF to: (1) aid appropriate source selection personnel in their specific evaluations, (2) influence negotiations with the contractor for full-scale development (production articles); and (3) aid in insuring direct changes to the aircraft for Task III (follow-on tests with the prototype aircraft) and for full-scale development, and thereby reduce the number of required engineering change proposals. The JTF fulfilled these objectives by using an AFFTC-developed report to record each deficiency, and by maintaining strict coordination/control of each report. This report was titled the A-X Prototype System Evaluation Report (SER) and was recognized officially by the A-X SPO. The SER's were utilized by all members of the JTF.

A summary of SER's and each SER in its entirety are included. The first digit of the serial number designates the aircraft type. The second set of digits designates the sequential numbers of the SER drafts as they were originated and logged. The third set of digits designates the sequential numbers of the formal SER's submitted to A-X SPO. As an example, SER No. 10-13-9 indicates that this item is on the A-10A aircraft, is the thirteenth SER originated by the JTF, and is the ninth SER submitted to the SPO for action.

The summary is presented by major subsystem. The SER's are arranged in sequential order of their formal or last digit(s).

A-10A SYSTEM EVALUATION REPORT SUMMARY

SER NO.	DATE (72)	SAFETY CODE	CORRECTION CATEGORY	DEFICIENCY
AIRFRAME (WUC 11000)				
10-13-9	2 Nov	II	M	Poor access to top of fuselage
10-19-11	10 Nov	II	D	Unacceptable nylon straps retaining lower fuselge acces doors
10-45-32	14 Nov	II	M	Lock in integral cockpit ingress/egress provisions
10-56-45	2 Dec	I	D	Large number of fasteners required for engine nacelle access doors
10-57-46	2 Dec	II	M	Excessive gap at air inlet duct/engine inlet interface
10-55-47	2 Dec	I	D	Potential damage to "coin-slotted" screws during removal
10-58-49	4 Dec	I	D	Difficulty in handling TACAN RT unit for removal and replacement
10-59-50	4 Dec	II	M	Crack in structure at F.S. 512 (aft fuel tank bulkhead stiffener)
COCKPIT (WUC 12000)				
10-1-4	2 Nov	II	M	Poor location (too far forward) of throttles
10-21-14	10 Nov	I	D	Poor location and actuation of throttle friction control
10-24-17	14 Nov	I	D	Difficult ingress to cockpit with parachute on
10-36-24	13 Nov	I	M	Lack of labeling of release mode control
10-31-25	14 Nov	II	M	Poor location of external lights control panel
10-32-26	14 Nov	I	M	Poorly designed latching device on ram inlet doors
10-35-27	15 Nov	II	M	Poor grouping of primary flight instruments

SER NO.	DATE (72)	SAFETY CODE	CORRECTION CATEGORY	DEFICIENCY
10-39-28	14 Nov	I	D	Poor grouping of engine instruments
10-41-29	15 Nov	I	D	Poor actuation of speed brake
10-43-30	15 Nov	I	D	Unsatisfactory grouping of light test buttons/switches
10-44-31	16 Nov	I	D	Uncomfortable parachute
10-40-34	18 Nov	I	M	Unconventional actuation direction of crossfeed and tank gate valve controls
10-38-42	27 Nov	I	D	Poor forward visibility
10-37-43	27 Nov	II	M	Unacceptable location of anti-skid switch
10-28-51	4 Dec	II	M	Poor canopy operation for emergency ground egress
10-66-56	5 Dec	II	M	Engine overtemperature during airstarts with throttles forward of IDLE
10-70-61	14 Dec	II	M	Poor access (beyond reach) of forward cockpit control surface
LANDING GEAR SYSTEM (WUC 13000)				
10-7-3	2 Nov	III	M	Poor location of brake components for forward airstrip operations
10-33-33	18 Nov	III	M	Possible hardover of nosegear after electrical component malfunction
10-61-53	4 Dec	II	M	Loss of normal braking system with both electrical systems inoperative
10-69-60	12 Dec	III	M	Loss of normal and emergency braking with anti-skid malfunction

SER NO.	DATE (72)	SAFETY CODE	CORRECTION CATEGORY	DEFICIENCY
FLIGHT CONTROL SYSTEM (WUC 14000)				
10-9-7	2 Nov	I	M	Lack of access to speed brake actuator
10-22-15	14 Nov	II	M	Poor location and mode of flap control
10-16-16	10 Nov	I	D	Poor material utilized in flight control surfaces
10-15-20	14 Nov	II	D	Undesired flap blowback
10-49-38	27 Nov	II	M	Lack of flight controls ground lock in cockpit
10-52-44	2 Dec	I	D	Poor access to aileron trim actuator
10-60-52	4 Dec	III	M	Inadequate switchover to and from manual reversion
PROPULSION SYSTEM (WUC 23000)				
10-2-1	2 Nov	III	M	Possible inadvertant double-engine shutdown
10-25-18	9 Nov	I	D	Difficulty in interpreting fan tachometer readings
10-62-54	6 Dec	II	M	Restricted access for fuel control removal/installation
10-65-55	2 Dec	II	M	Excessive carboning of engine carbureting scrolls
AUXILIARY POWER UNIT (WUC 24000)				
10-50-39	24 Nov	II	M	Poor location of APU inlet for unprepared surface operations
ENVIRONMENTAL SYSTEMS (WUC 41000)				
10-10-5	1 Nov	I	D	Lack of disconnect provisions on overtemperature sensor wiring of refrigeration package
10-47-36	27 Nov	II	M	Poor access to ventilation garment blower

SER NO.	DATE (72)	SAFETY CODE	CORRECTION CATEGORY	DEFICIENCY
LIGHTING SYSTEM (WUC 44000)				
10-27-23	13 Nov	I	M	Incompatability of interior lighting with task requirements
10-71-62	14 Dec	I	M	Lack of formation lights on forward fuselage
HYDRAULIC SYSTEM (WUC 45000)				
10-6-2	1 Nov	III	M	Unacceptable rapid bleeding at hydraulic pressure after engine shutdown
10-17-12	14 Nov	I	D	Inadequate dumping provisions for hydraulic reservoirs
10-23-22	14 Nov	I	D	Difficulty in reading hydraulic pressure gages
FUEL SYSTEM (WUC 46000)				
10-4-13	14 Nov	II	D	Inadequate fuel quantity indicating system
10-3-35	18 Nov	III	M	Inadequate fuel shutoff control for APU
10-48-37	24 Nov	II	M	Poor access to fuel cell probes
10-51-40	24 Nov	II	M	Inability to correct fuel imbalance
OXYGEN SYSTEM (WUC 47000)				
10-12-8	2 Nov	III	M	Unacceptable location of oxygen overflow vent
INSTRUMENTS (WUC 51000)				
10-14-10	6 Nov	II	M	Highly vulnerable location of pitot tube to maintenance activities
10-5-19	10 Nov	III	M	Functional inadequacy of attitude indicating system
10-46-41	30 Nov	I	D	Lack of HARS gyro cutoff circuit during maintenance activities

SER NO.	DATE (72)	SAFETY CODE	CORRECTION CATEGORY	DEFICIENCY
INTERPHONE (WUC 64000)				
10-18-21	10 Nov	II	M	Poor access to intercom headset cordage
RADIO NAVIGATION (WUC 71000)				
10-54-48	4 Dec	I	D	Difficulty in reading TACAN RT unit indicators
10-53-57	14 Dec	II	M	Inadequate marking of TACAN suppressor cables on RT unit
WEAPONS DELIVERY (WUC 75000)				
10-67-58	14 Dec	I	M	Inadequate access to electrical connector in pylons 3, 4, 7, 8 and 9
10-68-59	5 Dec	I	M	Lack of access panels on wing pylons 1 and 11
ALL AVIONICS				
10-8-6	2 Nov	II	D	Poor type of electrical connectors (solder-on)

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER: 10-2-1	DATE: 2 Nov 72		
RELATED SER NUMBERS:	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO(S).: 71-1369/-1370	TEST LOCATION: AFFTC
MAJOR SYSTEM/WUC: Power Plant Inst/29000	SUBSYSTEM/WUC: Throttles/29A00	COMPONENT PART NO./SERIAL NO.: N/A	

DEFICIENCY

Possible inadvertent double-engine shutdown.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The throttle system is designed to prevent inadvertent movements to OFF by outward displacement of the throttles preceeding full retraction. However, outward displacement of the right throttle results in outward displacement of the left throttle when both are at IDLE. A very light aft force on the left throttle as the right is moved to OFF will also shutdown the left engine. Inadvertent shutdown of the left engine is highly possible when shutdown of the right engine only is desired, unless extreme caution is exercised. In addition, when both throttles are at IDLE, they are subject to inadvertent outward movement if hit by the left hand. When inadvertently moved in this manner, both throttles catch on the lip of the idle stop. Any aft motion of the throttles from this position will result in a two-engine shutdown. The motion required to perform the outboard movement is similar to the motion of moving the left hand outboard to find the flap lever which is behind the throttles when they are at IDLE.

LOCAL ACTION

Extreme care by pilots when the throttles are at IDLE.

RECOMMENDATION If feasible, the prototype aircraft should be modified to preclude the above problem and the Flight Manual should be changed to reflect the care required. The full scale development article should be designed with a more positive means of shutting down individual engines. Consideration should be given to the use of a finger lift system rather than outward movement of the throttles.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [X] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[X] LOSS [X] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [X] INJURY [X] PERSONNEL	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [X] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*: R.D. BRIDGES, JR., Captain	ORGANIZATION *(Office Symbol)*: 6510TGH	DUTY PHONE: 72491
PROJECT ENGINEER *(Typed/printed name and grade)*: FRANK N. LUCERO, GS-13	SIGNATURE: Frank N. Lucero	DATE: 2 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)*: GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE: G Lynch	DATE: 3 Nov 72

 AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)	SER NUMBER 10-6-2	DATE 1 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Hydraulics/45000	PC-1 and PC-2/45A00&45G00	N/A

DEFICIENCY

Unacceptable rapid bleeding of hydraulic pressure after engine shutdown.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The hydraulic pumps are designed to reduce the supplied pressure to zero ("drop off the line") when engine core rpm drops to approximately 40 percent. During an engine stall, flame out or shutdown, loss of hydraulic pressure to the system supplied by the particular engine is nearly simultaneous with the engine loss. "Hydraulic system Out" caution lights, which indicate that hydraulic system pressure has dropped to zero, were monitored during engine shutdown on several flights. The lights were obtained at engine core rpm's ranging from 38 to 48 percent as the engine wound down. Consideration must be given to the hydraulic system functions which are lost nearly immediately after engine loss. For single engine loss, SAS and one hydraulic powered rudder are lost. Under certain flight conditions and/or A/C configurations this could be critical. If both engines are lost, a complete loss of powered flight controls would occur almost immediately placing the aircraft in the manual reversion mode in the longitudinal and directional axis. However, lateral (aileron) manual reversion control would require moving the aileron control switch to TAB DRIVE and then waiting until shifting is complete. This operation would require 5 seconds or more to complete. Aircraft control could be lost during this time if the aircraft was in a compromised position or attitude. The pilot would be faced with the immediate problem of aircraft control and engine relight.

LOCAL ACTION

None.

RECOMMENDATION Hydraulic system pressure should bleed off slowly after engine failure. This would allow time for the pilot to place aircraft in a safe attitude and move aileron control to drive tab in the case of a double engine failure. However, it is realized that by eliminating the "off the line" characteristics of the hydraulic pumps, that engine start up load requirements would be increased and may contribute to longer engine start.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

☐ FUNCTIONAL ☐ OPS ☒ DESIGN ☐ MATERIEL ☐ QC ☐ MAINT ☐ RELIABILITY ☐ PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
☐ I ☐ II ☒ III ☐ IV	☒ MANDATORY ☐ DESIRABLE	☒ LOSS — ☒ VEHICLE ☐ DAMAGE ☐ SUBSYSTEM ☒ INJURY — ☒ PERSONNEL	☐ PREVENTS ☒ DEGRADES ☐ RESTRICTS ☐ DELAYS ☐ MISSION ☐ MAINTENANCE ☐ SYSTEM PERFORMANCE ☒ FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491

PROJECT ENGINEER *(Typed/printed name and grade)*	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	2 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)*	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force		3 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-7-3	DATE 2 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Landing Gear/13000	SUBSYSTEM/WUC Brakes/13L00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Poor location of brake components for forward airstrip operations.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The hydraulic brakes lines and antiskid control wiring to each main landing gear brake are routed along the front of the landing gear strut. The wheel brake shuttle valve on the brake stack pressure plate is located in the lower forward quadrant of the plate on each main gear brake stack. In view of the possible forward airstrip requirement for the A-X aircraft, these are very vulnerable locations for these items. Brush and other ground debris could easily damage these components during takeoff or landing resulting in possible loss of braking, antiskid protection and one or both hydraulic systems. In addition, repairs would be required at the rough field base which would probably have a limited maintenance capability.

LOCAL ACTION

None.

RECOMMENDATION The hydraulic brake lines and antiskid control wiring should be routed along the rear of the main landing gear struts and the wheel brake shuttle valve should be located in the upper aft quadrant of the brake pressure plate in a manner which utilizes the strut and wheel for protection of these components.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [X] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[X] LOSS [X] DAMAGE [ ] INJURY [X] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [X] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

Hazard code applicable to forward airstrip operations only.

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
T.R. YECHOUT, Captain	6510TGH	72588
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 2 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 3 Nov 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-1-4	2 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Power Plant/29000	Throttles/29A00	N/A

DEFICIENCY

Poor location (too far forward) of throttles.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Pilots have reported the throttles are too far forward to reach with full authority, i.e. fingers cannot be curled around the leading edges of the throttle grip. In addition, when throttles are set at MAX, the microphone button and speed brake switch cannot be activated without a conscious, straining extension of the arm. An anthropometric study of reach distance required revealed that throttles set at MAX are two inches beyond the adjusted reach capability of the 5th percentile pilot.

LOCAL ACTION

None.

RECOMMENDATION

Throttle levers and/or quadrant should be redesigned to permit authoritative reach by 5th through 95th percentile pilots.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [ ] INJURY [ ] PERSONNEL (none)	[ ] PREVENTS [ ] MISSION [X] DEGRADES [ ] MAINTENANCE [ ] RESTRICTS [X] SYSTEM PERFORMANCE [ ] DELAYS [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	2 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[signature]	3 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER: 10-10-5	DATE: 1 Nov 72		
RELATED SER NUMBERS:	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO(S).: 71-1369/-1370	TEST LOCATION: AFFTC
MAJOR SYSTEM/WUC: Environmental Sys/41000	SUBSYSTEM/WUC: Refrigeration Pkg/41C00	COMPONENT PART NO./SERIAL NO.: N/A	

DEFICIENCY

Lack of disconnect provisions on overtemperature sensor wiring of refrigeration package.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The overtemperature sensor mounted on the refrigeration package has two wires which run directly from the sensor into an adjacent wire bundle. In order to replace the sensor, the wires must be cut and the new sensor spliced in. Past experience has shown the overtemperature sensor to be a high-fail type item. Also, to remove the refrigeration unit, it is necessary to either cut and splice these same wires or remove the one-foot section of ducting on which the sensor is mounted, and leave it with the airframe when the refrigeration package is removed.

LOCAL ACTION

None

RECOMMENDATION

A quick disconnect should be incorporated on these wires. The ideal configuration would be a connector that mated directly to the sensor.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [X] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL None	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [X] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade): J.J. DONNANGELO, SMSgt	ORGANIZATION (Office Symbol): 6510TGH	DUTY PHONE: 72695
PROJECT ENGINEER (Typed/printed name and grade): FRANK N. LUCERO, GS-13	SIGNATURE: Frank N. Lucero	DATE: 2 Nov 72
PROJECT MANAGER (Typed/printed name and grade): GEORGE P. LYNCH JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE: [signature]	DATE: 3 Nov 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)				SER NUMBER 10-8-6	DATE 2 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC		
MAJOR SYSTEM/WUC All Avionics	SUBSYSTEM/WUC All Avionics		COMPONENT PART NO./ SERIAL NO. N/A		

DEFICIENCY

Poor type of electrical connectors (solder-on)

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Solder-on connectors are used on the coaxial cable connections to all the avionics components. These connectors can be easily installed incorrectly. They can cause many intermittent problems, and take excessive time to install. There is danger of burns to personnel and to aircraft. A great amount of skill is necessary to install this type connector correctly. In addition, the use of solderless connectors is now very common throughout the Air Force and eliminates most of the above problems. Solderless connectors require the use of the following kit:

FSN 5180-103-3392LH,
P/N 4SG0047-101A,
Cost: $648.00

LOCAL ACTION

None.

RECOMMENDATION Crimp-on type solderless connectors should be used. This connector virtually eliminates connector problems. It is very easy and time saving to install with no soldering required. They are much more reliable and the skill required for installation is lower.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [X] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] VEHICLE [X] DAMAGE - [X] SUBSYSTEM [X] INJURY — [X] PERSONNEL	[ ] PREVENTS [ ] MISSION [X] DEGRADES [X] MAINTENANCE [ ] RESTRICTS [X] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
B.W. COOKE, TSgt	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 2 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE	DATE 3 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)		SER NUMBER	DATE
		10-9-7	2 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Flight Control/14000	Speed Brake/14S00	N/A

DEFICIENCY

Lack of access to speed brake actuator

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

No access is provided for performing maintenance, inspection, removal/installation of the speed brake actuator. Gaining access requires cutting away the fiberglass leading edge of the aileron assembly.

LOCAL ACTION

None.

RECOMMENDATION

Provide removable leading edge on the aileron assembly.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [X] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
I.E. KIRKPATRICK,	6510TGH	72695
PROJECT ENGINEER *(Typed/printed name and grade)*	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	2 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)*	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[illegible signature]	3 Nov 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)		SER NUMBER 10-12-8	DATE 2 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC
MAJOR SYSTEM/WUC Oxygen/47000	SUBSYSTEM/WUC LOX Sys/47C00	COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Unacceptable location of oxygen overflow vent.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The overflow oxygen vent is located approximately twenty-three (23) inches aft of the nose gear strut. The distance from the overflow vent to the ground is approximately four (4) feet. When liquid oxygen is serviced with the converter installed, the overflow liquid blows on the nose strut and nose gear tire. Both the nose strut and tire have grease and oil on them. If oxygen is permitted to mix with flammables such as grease and oil, the result can be highly explosive with possible loss of Air Force equipment and personnel.

LOCAL ACTION

None.

RECOMMENDATION The overflow oxygen vent should be relocated or the existing end should be threaded so an extension piece of tubing can be attached during servicing. This will allow the overflow liquid to vent into a drip pan or suitable container. This problem should be addressed on the prototype and full-scale development aircraft.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (*MIL-STD-882*)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [X] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[X] LOSS — [X] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [X] INJURY — [X] PERSONNEL	[X] PREVENTS — [X] MISSION [X] DEGRADES — [X] MAINTENANCE [ ] RESTRICTS [ ] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
D. PERSON, TSgt	6510TGH	72695
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 2 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE	DATE 3 Nov 72

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A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)	SER NUMBER: 10-13-9	DATE: 2 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Airframe/11000	Center Fuselage/11C00	N/A

DEFICIENCY

Poor access to top of fuselage.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Preflight, postflight, engine change and other normal maintenance requires maintenance personnel to have access to the top of the fuselage. The only way they can achieve this is to put one foot into the engine intake lip and climb up onto the top of the fuselage (current practice). The engine intake lip is not intended to be a foot hold and any foreign objects on the bottoms of their shoes could be drawn into the engine. In addition, the structure on the intake lip is not designed as a foot hold and could be damaged.

LOCAL ACTION

None.

RECOMMENDATION

Recommend a channeled out step be designed on each side of the fuselage forward of the intake lip to aid in access to the top of the fuselage.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

☐ FUNCTIONAL ☐ OPS ☒ DESIGN ☐ MATERIEL ☐ QC ☐ MAINT ☐ RELIABILITY ☐ PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
☐ I ☒ II ☐ III ☐ IV	☒ MANDATORY ☐ DESIRABLE	☐ LOSS ☒ DAMAGE ☐ INJURY ☐ VEHICLE ☒ SUBSYSTEM ☐ PERSONNEL	☐ PREVENTS ☒ DEGRADES ☐ RESTRICTS ☐ DELAYS ☐ MISSION ☐ MAINTENANCE ☒ SYSTEM PERFORMANCE ☐ FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
D. PERSON, TSgt	6510TGH	72695
PROJECT ENGINEER *(Typed/printed name and grade)*	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	2 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)*	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[signature]	3 Nov 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER: 10-14-10	DATE: 6 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO(S).: 71-1369/-1370	TEST LOCATION: AFFTC	
MAJOR SYSTEM/WUC: Instruments/51000	SUBSYSTEM/WUC: Flight Instr/51A20		COMPONENT PART NO./SERIAL NO.: N/A	

DEFICIENCY

Highly vulnerable location of pitot tube to maintenance activities

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The pitot tube is located just forward of the right hand avionics bay containing the SAS computer. To gain access to the SAS computer a ladder must be used; however, caution must be taken that the ladder rails straddle the pitot tube but do not strike it. Caution must also be used that the ladder rung does not hit the tube. After the ladder has been set properly against the aircraft it is still possible for personnel to step on the pitot tube while performing maintenance in the SAS bay.

LOCAL ACTION

None.

RECOMMENDATION

If feasible, the pitot tube should be re-located in a less vulnerable area, the SAS computer located in a position that will not require working near the pitot tube or access to the computer be placed in a different location.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] VEHICLE [X] DAMAGE [X] SUBSYSTEM [ ] INJURY [ ] PERSONNEL	[ ] PREVENTS [ ] MISSION [X] DEGRADES [X] MAINTENANCE [ ] RESTRICTS [X] SYSTEM PERFORMANCE [X] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
E.R. WICKENBERG	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	6 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G Lynch Jr	8 Nov 72

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A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-19-11	10 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./SERIAL NO.
Airframe/11000	Forward, Center Aft Fuselage/11A00,11C00,11E00	N/A

DEFICIENCY

Unacceptable nylon straps retaining lower fuselage access doors

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The A-10A aircraft utilizes nylon fabric straps to retain some of the fuselage access doors while they are in the open position. While this configuration is satisfactory in the hangar or in a "no wind" condition, the doors could swing and whip around causing damage to the doors and fuselage in windy conditions. Further difficulties could be encountered when the straps get wet in cold weather. They can become frozen causing damage to the straps and attachment components during movement of the doors.

LOCAL ACTION

None.

RECOMMENDATION

Conventional hinges should be used.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [X] DAMAGE [ ] INJURY [X] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [ ] DEGRADES [ ] RESTRICTS [X] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
B.E. FOX, GS-9	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	13 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G. P. Lynch	14 Nov 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-17-12	DATE 14 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Hydraulic/45000	SUBSYSTEM/WUC PC-1 & PC-2 Power Supply/45A00,45G00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Inadequate dumping provisions for hydraulic reservoirs

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The right and left hydraulic reservoir dump valves are actuated by a small cable routed through a metal tube. This method of actuating the dump valves is not satisfactory. When maintenance is performed in the hydraulic bay, the reservoir could be easily dumped accidentally, if tools or lines became intangled in the loop.

LOCAL ACTION

None.

RECOMMENDATION

Safety provisions should be provided to prevent inadvertent dumping. Consideration should be given to installing a small rod and lever with safety wiring provisions.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
I.E. KIRKPATRICK, GS-11	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 14 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G P Lynch	DATE 14 Nov 72

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A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-4-13	14 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Fuel/46000	Fuel Quantity/46C00	N/A

DEFICIENCY

Inadequate fuel quantity indicating system

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The fuel quantity indicating system in the cockpit consists of a single needle indicator, a digital counter type indicator and a fuel display selector switch. The pilot must move the selector switch to each individual tank position to display the fuel quantity on the indicator. The selector switch has eight positions: L MAIN, R MAIN, L WING, R WING, L EXT, R EXT, C EXT and TOT MAIN. The digital indicator indicates total fuel continuously. The selector switch must be rotated to seven different positions to check the fuel status of each tank. Since external fuel tanks are not carried on the prototype, only four positions must be checked during the AFFE test missions. However, the pilots find that it is time consuming and difficult to adequately monitor the status of the fuel system. The indicator does not contribute to early recognition of problems with fuel feeding, or loss or imbalance. Upon recognition of a problem, fuel checks must be made frequently. The time consumed on fuel checks detracts from mission effectiveness. This is particularly evident in high pilot workload missions such as weapons delivery.

LOCAL ACTION

None.

RECOMMENDATION

The indicator should incorporate a two-needle system with one needle labeled LEFT and the other RIGHT. Consideration should be given to providing the selector switch with the following positions: (1) L/R MAIN, (2) L/R WING, (3) L/R EXT, (4) C EXT. Selecting

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (*MIL-STD-882*)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [X] RESTRICTS [ ] DELAYS [X] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491

PROJECT ENGINEER *(Typed/printed name and grade)*	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	14 Nov 72

PROJECT MANAGER *(Typed/printed name and grade)*	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[illegible]	14 Nov 72

 AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-4-13 CONTINUED:

the C EXT should cause both needles to overlay to read centerline external tank fuel. The digital counter should be retained to indicate total fuel onboard. Incorporation of this type of fuel system would allow the pilot to monitor the left and right tanks at all times and also monitor total fuel without any switch action required. The other tanks could be checked with half the switching action required in the prototype aircraft. In addition, the elimination of the TOT MAIN position would reduce the maximum scale required which would allow the size of the indicator to be reduced, if desired.

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-21-14	DATE 10 Nov 72
RELATED SER NUMBERS 10-22-15	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Cockpit & Fuselage/12000	SUBSYSTEM/WUC Cockpit/12A00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Poor location and actuation of throttle friction control

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The lever type throttle friction control is located on the outboard side of the throttle quadrant, adjacent to the flap control. This is a once-a-flight adjustment control under normal conditions and occupies much valuable space, particularly by crowding the flap control too close to the throttles reducing flap control accessibility (see SER 10-22-15). In addition, the present adjustment of the throttle friction lever eliminates its effective use, i.e., a very small increase (forward movement) of friction setting will render the throttles unmanageably resistant to movement. Most pilots have been setting the control at or close to the lowest friction setting (full aft). Thus, the vast majority of lever displacement (travel distance) is never utilized.

LOCAL ACTION

None.

RECOMMENDATION (1). The throttle friction control should be removed from the throttle quadrant proper (IAW DH1-3, DN2D5, para 1.3.3). Consideration should be given to locating this lever on the inboard side of the left console, if feasible, or any other suitable area at the periphery of the left console (see DH1-3, DN2D6, para 5). (2) The band

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 13 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Test Team	SIGNATURE	DATE 14 Nov 72

 AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-21-14 CONTINUED:

width of desirable friction level should be adjusted to provide the pilot greater discrimination in his selection of throttle friction.

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER 10-22-15	**DATE** 14 Nov 72		
RELATED SER NUMBERS 10-2-1, 10-21-14	**VEHICLE TYPE** A-10A	**VEHICLE SERIAL NO(S).** 71-1369/-1370	**TEST LOCATION** AFFTC
MAJOR SYSTEM/WUC Flight Controls/14000	**SUBSYSTEM/WUC** Flight Controls, Cockpit/14A00	**COMPONENT PART NO./SERIAL NO.** N/A	

DEFICIENCY

Poor location and mode of actuation of flap control

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The relative position of the flap control and throttles restricts accessibility to the flap lever particularly with throttles set at IDLE. On several occasions, the throttles have been accidentally moved when the pilot reached for the flap control. Although part of the problem has been attributed to poor throttle quadrant design (see SER 10-2-1) it is compounded by the unnecessarily large control displacement required to activate the flaps to their full up position. Moreover, close proximity of the flap lever to the throttles restricts safe and convenient access. Additional actuation difficulty is encountered because the flap lever detents are poorly defined. The pilots must crosscheck the flap indicator and search for the proper position of the flap lever to obtain the desired flap travel.

LOCAL ACTION

Extreme care by pilots when the throttles are at IDLE.

RECOMMENDATION (1) The flap lever displacement (travel distance) should be decreased by at least 50 percent, relocating the full up position further aft (at approximately the center position of the throttle quadrant). (2) The flap control should be placed further outboard from the throttles as required by DH 1-3, DN 2D5, para. 1.2. and 1.3.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] DAMAGE [ ] INJURY [X] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)* R.D. BRIDGES, JR., Captain	**ORGANIZATION** *(Office Symbol)* 6510TGH	**DUTY PHONE** 72491
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	**SIGNATURE** Frank N. Lucero	**DATE** 14 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	**SIGNATURE**	**DATE** 14 Nov 72

 AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-22-15 CONTINUED:

This can be accomplished in conjunction with relocation of the throttle friction lever (see SER 10-21-14). (3) Flap lever detents should be designed and calibrated to provide positive and accurate lever movement to specified detents for each standard flap setting (takeoff, landing, maneuvering, etc.).

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-16-16	DATE 10 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Flight Controls/14000	SUBSYSTEM/WUC		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Poor material utilized in flight control structures

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Honeycomb sandwich construction is used for many of the component parts, such as flap trailing edges, wing trailing edges, elevators, rudder and speed brakes. The core material is NOMEX which is equally as difficult to repair in the field as the aluminum core. Satisfactory field repair for honeycomb is practically non-existant except for repair of minor punctures and dents. Field repair for honeycomb is almost always a matter of removing and replacing the part, leaving the repair to "depot level repair and facilities." In view of the specialized close air support mission of the A-X and the possible resultant damage from ground fire, a stockpile of honeycomb parts would have to be maintained at field level facilities.

LOCAL ACTION

None.

RECOMMENDATION An engineering study or review should be conducted on the selection of materials to include the following aspects: (1) The use of stress corrosion susceptible alloys and heat treats should be avoided wherever possible. Consideration should be given to the use of material, such as 7075-T73, instead of 7075-T6. If 7075-T6 is used, positive stress corrosion control methods are mandatory. (2) The use of honeycomb

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [ ] RESTRICTS [X] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
B.E. FOX, GS-9	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 13 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE [illegible]

AFFTC FORM AUG 72 2

RECOMMENDATION TO SER NUMBER 10-16-16 CONTINUED:

sandwich construction should be avoided except where cost and/or weight advantages outweigh the problems associated with field repair.

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-24-17	DATE 14 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Cockpit & Fuselage Compartments/12000	SUBSYSTEM/WUC Canopy/12C00		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Difficult ingress to cockpit with parachute on

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

It is almost impossible for the pilot to enter the cockpit while wearing a parachute without it snagging on the open canopy frame. This has been noted by all A-X JTF pilots.

LOCAL ACTION

None.

RECOMMENDATION

The capability to open the canopy an additional 4 - 6 inches should be provided, as required by DH 1-3, DN 3L1, para. 4.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

☐ FUNCTIONAL ☒ OPS ☒ DESIGN ☐ MATERIEL ☐ QC ☐ MAINT ☐ RELIABILITY ☐ PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
☒ I ☐ II ☐ III ☐ IV	☐ MANDATORY ☒ DESIRABLE	☐ LOSS ☐ DAMAGE ☐ INJURY ☐ VEHICLE ☐ SUBSYSTEM ☐ PERSONNEL (None)	☐ PREVENTS ☐ DEGRADES ☒ RESTRICTS ☐ DELAYS ☐ MISSION ☐ MAINTENANCE ☐ SYSTEM PERFORMANCE ☒ FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 14 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 14 Nov 72

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A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-25-18	9 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Power Plant Installation/29000	Engine Instruments/29L00	N/A

DEFICIENCY

Difficulty in interpreting fan tachometer readings

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The fan tachometers are read in units of actual rpm (X 1000), calibrated from 0 to 8 with an expanded scale above 6. Pilots are trained to make power performance and contro decisions on the basis of the proportion (percent) of total available rpm needed. To lend meaning to actual rpm values, pilots must learn their relation to the upper limit value, whatever it may be for a particular system. Percent rpm values are applicable across all systems and interpretation is a simple matter, once learned. The system-specific nature of actual rpm values creates an additional and unnecessary learning task. Modification of an integral subsystem (e.g., engine or engine component) may change the upper limit rpm value, necessitating a reinterpretation of actual rpm values.

LOCAL ACTION

None.

RECOMMENDATION The fan tachometers should employ percent rpm units in preference to actual rpm units in order to facilitate operator understanding with minimum effort and delay as noted in DH 1-3, DN 2C1, para. 1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
A. BARNES, Captain	6510TGH/TAC	73891
PROJECT ENGINEER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	13 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[signature]	14 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-5-19	10 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./SERIAL NO.
Instruments/51000	Flight Instruments/51A00	N/A

DEFICIENCY

Functional inadequacy of the attitude indicating system

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The attitude indicating system consistently malfunctioned during flight. This problem was apparent throughout Task I. Precession in the pitch and roll axis of up to 30 degrees was common especially on the weapons delivery missions. On several flights the system became totally inoperative. At the start of Task II the attitude indicating system was carried as an open pilot write-up. Attempts to correct the problem were made including several changes of the gyro and gyro amplifier. None of these corrections eliminated the problem. As an interim solution, a system was installed to erect the ADI rapidly to the straight and level attitude. Realignment of the ADI required the pilot to fly the aircraft in the straight and level attitude and depress the fast erect button. The fast erect feature realigned the ADI system under conditions where straight and level flight could be maintained; however, it did not solve the problem and was unusable during weapons delivery. It would be unacceptable during instrument flight conditions. The lack of an accurate and reliable attitude indicating system presented a definite hazard to flight, especially instrument flight, and degraded accuracy during weapons delivery missions.

LOCAL ACTION

None.

RECOMMENDATION

A functionally adequate, accurate and reliable HARS should be provided.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[X] FUNCTIONAL [ ] OPS [ ] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [X] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [X] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[X] LOSS [X] DAMAGE [ ] INJURY [X] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [X] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
T.R. YECHOUT, Captain	6510TGH	72588
PROJECT ENGINEER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	13 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force		14 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-15-20	14 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./SERIAL NO.
Flight Controls/14000	Flaps/14000	N/A

DEFICIENCY

Undesired flap blowback

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Flap blowback occurred when the selected flap position was approximately 20 degrees and higher and varied with airspeed. The flap handle had to be adjusted continually to compensate for the change. During one flight, the flap handle was set at the maximum position (40 degrees). At 100 KIAS, an actual flap position of 35 degrees was noted and at 200 KIAS, actual positions of 25 and 28 degrees were noted. The flap blowback was less severe (1-2 degrees) at lower selected settings of approximately 20 degrees. (This report does not refer to the blowback protection system that is designed to retract the flaps at approximately 230 KIAS to prevent structural damage.)

LOCAL ACTION

None.

RECOMMENDATION

The flap system should be designed so that the actual flap position coincides with the selected setting throughout the approved flap airspeed envelope.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
T.R. YECHOUT, Captain	6510TGH/TGES	72588
PROJECT ENGINEER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	14 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[signature]	14 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)	SER NUMBER	DATE
	10-18-21	10 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Interphone/64000	Intercom Set/64A00	N/A

DEFICIENCY

Poor access to intercom headset cordage

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Access for replacement of the ICS headset cordage is very poor. The cordage is routed along with a wiring bundle down behind the ejection seat to a quick disconnect cannon plug. Removal of the seat would be required to gain access to the cannon plug. This would increase the removal/replacement frequency of the seat which is unsatisfactory because of the explosive devices installed. Although ICS cordage failures have not been a problem on the A-X prototype aircraft, a high failure rate has been noted on other aircraft by maintenance personnel assigned to the A-X Joint Test Force.

LOCAL ACTION

None.

RECOMMENDATION

A quick disconnect cannon plug should be mounted in the cockpit area on the bulkhead to the right and aft of the ejection seat. Access to the plug should not require removal of the seat.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [X] INJURY [ ] VEHICLE [ ] SUBSYSTEM [X] PERSONNEL	[ ] PREVENTS [X] DECRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
B.W. COOKE, TSgt	6510TGH	72695
PROJECT ENGINEER *(Typed/printed name and grade)*	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	13 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)*	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G.P. Lynch Jr	14 Nov 72

 AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-23-22	14 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

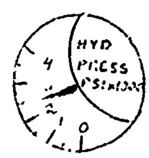
MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Hydraulic Power Supply/45000	PC-1&PC-2 Indicating & Warning Sys/45E00,45L00	N/A

DEFICIENCY

Difficulty in reading hydraulic pressure gages

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Two hydraulic pressure gages, one for each power system, are located on the far right side of the instrument panel. They are calibrated in thousands of pounds per square inch (psi), ranging from 0 to 4 (psi X 1000). The scale begins with 0 at the 6 o'clock position and ends with 4 at the 10 o'clock position, as shown in the following figure. This results in utilizing only one third of the entire gage face. Due to the combination of location, size (1 inch diameter), parallax, and inefficient use of the gage face, these indicators are extremely difficult to read.



LOCAL ACTION

None.

RECOMMENDATION (1) The hydraulic indicators should be enlarged in relation to the viewing distance in accordance with DH 1-3, DN 2C1, para. 2.1. At present, these indicators are the smallest gages in the cockpit but entail the greatest viewing distance. (2) The production gages should allow for offset viewing to alleviate the effects of

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.F. ARD, Captain	6510TGH/SGUM	72588

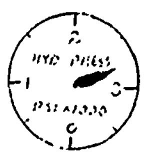
PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	14 Nov 72

PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[signature]	14 Nov 72

AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-23-22 CONTINUED:

parallex in accordance with DH 1-3, DN 2C1, para. 2.3. (3) The entire 360 degrees of gage face should be utilized for scale display, as shown in the following figure. This would afford greater accuracy of reading, including a more positive recognition of direction and rate of changes, which are often the first indication of ensuing hydraulic failure.



A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-27-23	DATE 13 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-3169/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Lighting System/44000	SUBSYSTEM/WUC Interior Lighting System/44C		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Incompatibility of interior lighting with task requirements

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Armament panel lighting is controlled by the CONSOLES rheostat control on the interior lights control panel. There is no provision for adjustment of armament panel lighting independent of left and right console lighting. During night bombing runs where target detection is by nature a difficult task, any and all sources of light can be held to an absolute minimum. Although armament panel lighting is essential for a night bombing mission, there is no operational need for sumultaneous console lighting. In addition, during night instrument flight when console lighting is required, illumination of the armament panel is purposeless, distractive, and wasteful of lamp life.

LOCAL ACTION

None.

RECOMMENDATION Compatibility of lighting with task requirements should be accomplished in accordance with MIL-STD-1472A, para. 5.8.2. A separate rheostat should be provided to control independently the intensity of the armament panel lighting.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [X] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
A. BARNES, Captain	6510TGH/TAC	73891
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 13 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G.P. Lynch	DATE 14 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-36-24	DATE 13 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Cockpit & Fuel/12000	SUBSYSTEM/WUC Cockpit/12A00		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Lack of labeling of release mode control

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The release mode control is a discrete rotary selector switch on the armament section of the instrument panel. It is a multiple position switch with all positions except OFF labeled. Lack of an OFF label can result in selection of an undesired position.

LOCAL ACTION

None.

RECOMMENDATION

All positions of the release mode control should be appropriately labeled in accordance with AFSC DH 1-3, DN 2D4, para. 6.5.2.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 13 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G.P. Lynch Jr	DATE 14 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-31-25	1[illegible] Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Cockpit & Fuselage/12000	Cockpit/12A00	N/A

DEFICIENCY

Poor location of the external lights control panel

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The external lights control panel is located on the right console and aft of the internal lights control panel. In this location, it is extremely awkward during flight to see the settings of the controls which require adjustment for certain tasks. External light adjustments must be made frequently during night formation flying and are a useful formation signal device at night when a wingman has radio failure. Visual inspection of the external lights controls is the primary source of feedback to the pilot concerning their proper setting. The difficulty incurred is unnecessary, distractive, and impairs pilot effectiveness.

LOCAL ACTION

None.

RECOMMENDATION

Locations of the exterior and interior lights control panels should be reversed. This would permit easier visual inspection of external light control settings. Interior light controls need not be seen to be properly adjusted since intensity is directly observable.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] VEHICLE [X] DAMAGE [ ] SUBSYSTEM [ ] INJURY [ ] PERSONNEL	[ ] PREVENTS [ ] MISSION [X] DEGRADES [ ] MAINTENANCE [ ] RESTRICTS [ ] SYSTEM PERFORMANCE [ ] DELAYS [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491

PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	15 Nov 72

PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G.P. Lynch	16 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER: 10-32-26	DATE: 14 Nov 72			
RELATED SER NUMBERS:	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO(S).: 71-1369/-1370	TEST LOCATION: AFFTC	
MAJOR SYSTEM/WUC: Cockpit & Fuselage/12000	SUBSYSTEM/WUC: Cockpit/12A00	COMPONENT PART NO./ SERIAL NO.: N/A		

DEFICIENCY

Poorly designed latching device on ram air inlet doors

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Ram air ventilation is provided in the event of ECS air conditioning failure. A louvered opening is located on both the left and right forward ends of the windshield base structure. For emergency ventilation during flight, the inlet door is manually unlatched and the aft end is free to rotate inboard, allowing ambient air to flow into the crew compartment. Operation is routine; however, the latching device must first be aligned into position by the pilot to close the inlet door. Difficulty is continually encountered performing this task arising from the delicacy of manipulation involved. The time and attention required to close the inlet doors unnecessarily detracts from effective mission performance. Moreover, prolonged flight with ram air vents open will subject the pilot to ambient air temperature extremes.

LOCAL ACTION

None.

RECOMMENDATION The ram air inlet doors and latching device should be designed to function with a minimum of pilot effort in accordance with MIL-STD-1472A, para. 5.14.1. Consideration should be given to providing inlet doors which are self-latching/locking when the doors are shut.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

☐ FUNCTIONAL ☐ OPS ☒ DESIGN ☐ MATERIEL ☐ QC ☐ MAINT ☐ RELIABILITY ☒ PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
☒ I ☐ II ☐ III ☐ IV	☒ MANDATORY ☐ DESIRABLE	☐ LOSS ☐ DAMAGE ☐ INJURY ☐ VEHICLE ☐ SUBSYSTEM ☐ PERSONNEL (None)	☐ PREVENTS ☒ DEGRADES ☐ RESTRICTS ☐ DELAYS ☐ MISSION ☐ MAINTENANCE ☒ SYSTEM PERFORMANCE ☒ FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*: R.D. BRIDGES, JR., Captain	ORGANIZATION *(Office Symbol)*: 6510TGH	DUTY PHONE: 72491
PROJECT ENGINEER *(Typed/printed name and grade)*: FRANK N. LUCERO, GS-13	SIGNATURE: Frank N. Lucero	DATE: 15 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)*: GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE: [illegible]	DATE: 16 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-35-27	DATE 15 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./SERIAL NO.
Cockpit & Fuselage/12000	Cockpit/12A00	N/A

DEFICIENCY

Poor grouping of primary flight instruments

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The location of the basic four flight instruments (attitude indicator, horizontal situation indicator, airspeed indicator, and altimeter) are optimum; however, the location of the vertical velocity indicator (VVI) and the angle of attack (AOA) indicator are unacceptable.

The VVI is located on the opposite side of the cockpit from the altimeter. This location increases the instrument cross-check time and makes precision attitude hold maneuvers more difficult to fly. In some cases, the VVI is excluded from the cross-check because of the increased time required to reference it. The integration of the information disrupts the basic cross-check and degrades precision.

The AOA indicator is also too far from the basic grouping. In its present location it is difficult to read. Parallax causes a partial blanking of the indicator in the range from approach to stall. An obvious effort must be made to shift the head and eyes to cross-check the indicator; consequently, it is often neglected or disregarded in the cross-check.

LOCAL ACTION

None.

RECOMMENDATION Considering the capability of the aircraft to fly missions of long duration the lack of an autopilot, and the probability of encountering instrument weather conditions in the low altitude environment, priority on instrument panel space should be given to produce the most efficient grouping of primary flight instruments. The VVI

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [ ] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [X] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 16 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 16 Nov 72

AFFTC FORM AUG 72 2

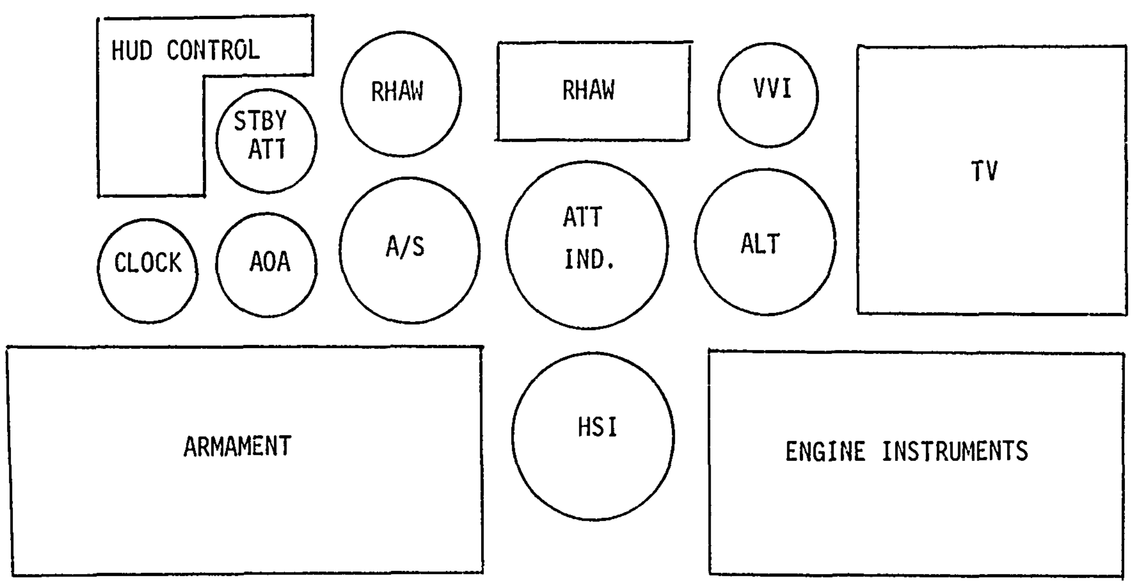
RECOMMENDATION SER NUMBER 10-35-27 CONTINUED:

should be moved closer to the altimeter and the AOA indicator should be placed in the location presently occupied by the VVI next to the airspeed indicator. Two schemes could be used to provide room for the VVI to be located next to the altimeter:

(1) Remove the APU instruments from the front panel, rearrange the engine instrument panel, and place the VVI in the position occupied by the fan tachometers.

(2) Place the VVI above the altimeter in the position reserved for the RHAW system. Replace the HUD control panel with the RHAW system. Redesign the HUD control panel to use the space presently occupied by the AOA indicator, the fire detect and bleed air leak check button and the fire agent discharge switch. Remove the fire detect and bleed air leak check button from the front panel and relocate it on the lower edge of the caution light panel next to the caution light panel test button. This would improve the functional grouping of light test buttons. Redesign and relocate the fire agent discharge switch to the edge of the glareshield between the fire handles. This would improve functional grouping.

The second method is preferred and should be considered since it would result in a much better arrangement of all switches and indicators. The following diagram shows the new arrangement which would comply with MIL-STD-1472A, para. 5.2.1.3.6. and 5.2.1.3.7.



A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-39-28	14 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Cockpit & Fuselage/12000	Cockpit/12A00	N/A

DEFICIENCY

Poor grouping of engine instruments

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The engines are primarily controlled by monitoring temperature; however, the engine temperature indicators are located in the second row of engine instruments. This position does not facilitate rapid cross-checking of engine indicators.

LOCAL ACTION

None.

RECOMMENDATION

The engine instruments should be arranged in accordance with MIL-STD-1472, para. 5.2.1.3.9. Consideration should be given to the arrangement shown in the attached diagram.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [ ] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

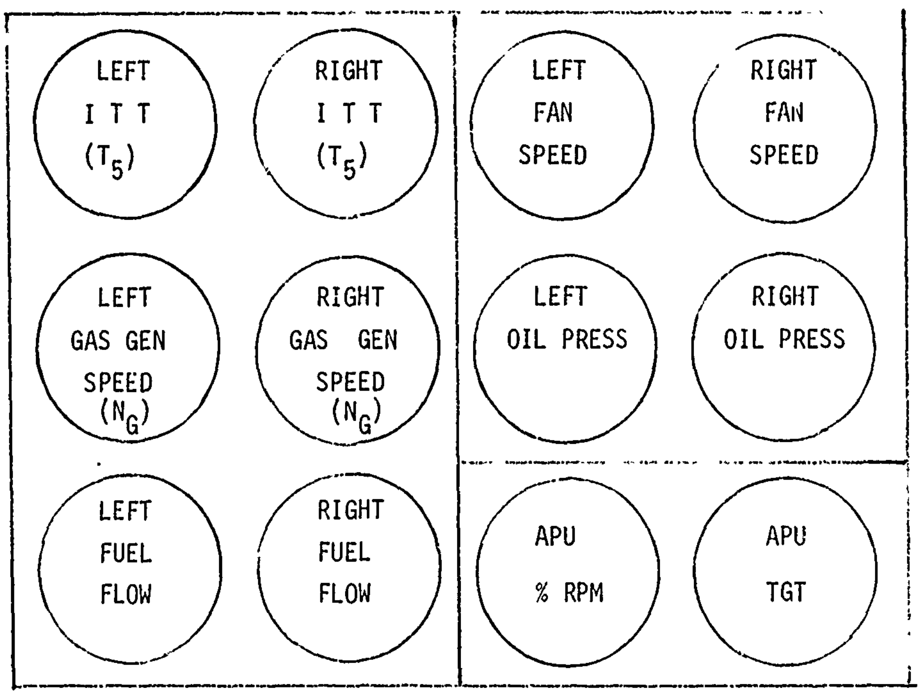
SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	15 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G P Lynch	15 Nov 72

AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-39-28 CONTINUED:



ENGINE INSTRUMENT REARRANGEMENT

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-41-29	DATE 15 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Cockpit & Fuselage/12000	SUBSYSTEM/WUC Cockpit/12A00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Poor actuation of speed brake switch

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The speed brake switch is a three position switch with the center position being OFF. The switch throw is too short and the position detents are too weak to allow the pilot to obtain accurate incremental speed brake settings such as those required to modulate base leg and final approach landing speeds or to complete a formation rejoin. Pilots often overshoot the center detent after setting an incremental speed brake. As a result, much more attention must be diverted to the setting of speed brakes than is desirable to allow use of the system to its fullest capability.

LOCAL ACTION

None.

RECOMMENDATION

The switch throw should be increased and the switch position detents should be stronger.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 15 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G. Lynch, Jr.	DATE 15 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-43-30	DATE 15 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Cockpit & Fuselage/12000	SUBSYSTEM/WUC Cockpit/12A00		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Unsatisfactory grouping of light test buttons/switches

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Five separate buttons/switches are used to test the cockpit warning/caution/advisory lights: (1) landing gear warning test switch; (2) fire detect and bleed air leak test button; (3) armament panel light test button; (4) caution light test button; and (5) signal light test button. These five light test switches/buttons are spread over the cockpit in five different locations. Although the lights are normally only tested once per flight, the separate switches use valuable cockpit space and increase the complexity of the preflight cockpit checks more than necessary.

LOCAL ACTION

None.

RECOMMENDATION

The test buttons/switches should be located in one convenient location and their functions should be combined as much as possible. The lower edge of the caution light panel next to the caution light test button should be considered as an appropriate location.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 15 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G. Lynch	DATE 16 Nov 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)	SER NUMBER 10-44-31	DATE 16 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Cockpit & Fuselage/12000	Ejection Seat/12G00	N/A

DEFICIENCY

Uncomfortable parachute

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The force deployed parachute utilized is extremely uncomfortable and will induce pilot fatigue and degrade mission effectiveness in an aircraft designed for long duration missions. The parachute has an extremely stiff backing which will not bend to fit the contour of the pilot's back. Proper adjustment of the parachute straps forces the pilot's back into an uncomfortably straight position. It is difficult to reach across the body and touch the opposite arm or shoulder because of the stiff parachute. The parachute is heavier than the non-force deployed parachute; consequently, more effort is expended holding the extra weight while leaning forward to accomplish normal cockpit functions. In addition, the CRU-60/P oxygen connector presses into the upper right arm muscle when the right hand is positioned normally on the control stick. During missions of long durations or hard maneuvering, the additional pressure on the muscle causes early fatigue and pain.

The force deployed parachute must be stored in special storage areas when not in use. This becomes an acute problem during cross country or divert missions to bases without proper storage facilities.

LOCAL ACTION

None.

RECOMMENDATION

An ejection system should be selected that utilizes an integral parachute with an adequate supporting framework for the body in accordance with MIL-STD-1472A, para. 5.14.2.4.1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
FRANK N. LUCERO, GS-13	Frank N. Lucero	16 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	**SIGNATURE**	**DATE**
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[illegible]	[illegible] 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-45-32	DATE 14 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Airframe/11000	SUBSYSTEM/WUC Cockpit Entry/Exit/11ADQ		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Lack of integral cockpit ingress/egress provisions

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Lack of integral cockpit ingress/egress provisions necessitates the use of an entrance ladder. This would be unacceptable during emergency egress because of the likelihood of personnel injury and during bare base or unprepared surface operations when a ladder may not be available.

LOCAL ACTION

None.

RECOMMENDATION

An integral cockpit ingress/egress ladder or kick-in steps should be provided.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [X] INJURY [ ] VEHICLE [ ] SUBSYSTEM [X] PERSONNEL	[ ] PREVENTS [ ] DEGRADES [ ] RESTRICTS [X] DELAYS [X] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
R.F. ARD, Captain	6510TGH/SGUM	72588
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 15 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 16 Nov 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-33-33	DATE 18 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Landing Gear/13000	SUBSYSTEM/WUC Nosewheel steering/13J00		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Possible hardover of nosegear after electrical component malfunction

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Operation of the nosewheel steering system is restricted to low speed taxi because of possible hardover malfunctions. The contractor has indicated that hardovers may be caused by a broken wire in the electro-hydraulic command system or by a command potentiometer malfunction. Use during directional control emergencies on the ground is allowed by the Flight Manual; however, the pilot is instructed to use steering only as a last resort. In this situation he would be required to distinguish a possible hardover in addition to handling the existing emergency.

LOCAL ACTION

None.

RECOMMENDATION

The nosewheel steering system should be designed to eliminate possible hardover malfunctions and restrictions to operations during taxi, landing or takeoff.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [X] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[X] LOSS — [X] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [X] INJURY [X] PERSONNEL	[ ] PREVENTS [X] MISSION [X] DEGRADES [ ] MAINTENANCE [X] RESTRICTS [X] SYSTEM PERFORMANCE [ ] DELAYS [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
T.R. YECHOUT, Captain	6510TGH/TGES	72588
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 21 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 22 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-40-34	DATE 18 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Cockpit & Fuselage/12000	SUBSYSTEM/WUC Cockpit/12A00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Unconventional actuation direction of crossfeed and tank gate valve controls

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The engine crossfeed and tank gate valve controls are two-place toggle switches located on the fuel system control panel. Both are presently designed so that aft movement opens the valves and forward movement closes the valves. This unconventional movement may result in selection of an undesired position setting, since they are not conveniently located for visual inspection during flight.

LOCAL ACTION

None.

RECOMMENDATION

The position settings of the engine crossfeed and tank gate valve controls should be designed so that forward placement shall open the respective valve in accordance with MIL-STD-1472A, para. 5.4.1.2.1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/~~MAINTENANCE~~ CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.F. ARD, Captain	6510TGH/SGUM	72588
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 21 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 22 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-3-35	DATE 18 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Fuel/46000	SUBSYSTEM/WUC Fuel/46A00		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Inadequate fuel shutoff control for APU

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Pulling of the left engine fire handle shuts off fuel not only to the left engine but also to the APU. This feature renders the APU inoperative once the left engine fire handle has been pulled. Airstart capability for the right engine is significantly reduced or eliminated without the APU as windmill airstarts can be accomplished only at high airspeeds with large altitude losses during the dive.

LOCAL ACTION

None.

RECOMMENDATION

The APU fuel system should be redesigned to allow fuel flow to the APU when either engine fire handle has been pulled. APU fuel shutoff should be accomplished by the APU fire handle only.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [X] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[X] LOSS [X] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [ ] INJURY [ ] PERSONNEL	[ ] PREVENTS [X] MISSION [X] DEGRADES [ ] MAINTENANCE [ ] RESTRICTS [ ] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 21 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G Lynch	DATE 22 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-47-36	DATE 27 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Environmental/41000	SUBSYSTEM/WUC Blower/41J00		COMPONENT PART NO./SERIAL NO. CB349-330	

DEFICIENCY

Poor access to ventilation garment blower

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The blower, which inducts and delivers cabin ambient air for circulation within the ventilating garment, is located on the cockpit floor behind the pilot's ejection seat. Maintenance and inspection cannot be performed on the blower without first removing the seat. This increases the requirement for removal/replacement of the seat which is unsatisfacto.y because of the explosive devices installed and maintenance time required.

LOCAL ACTION

None.

RECOMMENDATION

Access to the blower should not require removal of the seat according to MIL-STD-1472A, para. 5.9.4.6 and 5.9.4.7.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [X] INJURY [ ] VEHICLE [ ] SUBSYSTEM [X] PERSONNEL	[ ] PREVENTS [X] DEGRADES [X] RESTRICTS [ ] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.P. STOOTS, TSgt	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 27 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE	DATE 28 Nov 72

 AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)		SER NUMBER 10-48-37	DATE 24 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC
MAJOR SYSTEM/WUC Fuel/46000	SUBSYSTEM/WUC Fuel Quantity/46C00		COMPONENT PART NO./SERIAL NO. N/A

DEFICIENCY

Poor access to fuel cell probes

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The fuel quantity probes are mounted inside each fuel cell. This provides poor access for probe removal and replacement. In order to remove and replace a probe, the aircraft must be defueled and placed in an open fuel cell area and the panels on the underside of the wings must be removed. The cells have to be purged to remove fuel fumes for personnel safety.

LOCAL ACTION

None.

RECOMMENDATION

Externally mounted fuel quantity probes should be installed from the top surface of the wing in accordance with MIL-STD-1472A, para. 5.9.4.1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [X] INJURY [ ] VEHICLE [ ] SUBSYSTEM [X] PERSONNEL	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [X] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
G.D. ELDRIDGE, SMSgt	6510TGH	72695
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 24 Nov 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [illegible]	DATE [illegible]

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER: 10-49-38	DATE: 27 Nov 72
RELATED SER NUMBERS:	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO(S).: 71-1369/-1370	TEST LOCATION: AFFTC	
MAJOR SYSTEM/WUC: Flight Controls/14000	SUBSYSTEM/WUC: N/A		COMPONENT PART NO./ SERIAL NO.: N/A	

DEFICIENCY

Lack of flight controls ground lock in cockpit

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

A system of locking the control surfaces for protection against wind damage, during parking or storage, is not provided for the A-10A aircraft. In a gusty wind these control surfaces could be slammed against their maximum travel stops which could result in damage to the structure supporting the actuating mechanisms and the surfaces.

LOCAL ACTION

None.

RECOMMENDATION

A means of locking the control surfaces on the ground should be provided in the cockpit.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

☐ FUNCTIONAL ☐ OPS ☒ DESIGN ☒ MATERIEL ☐ QC ☐ MAINT ☐ RELIABILITY ☐ PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
☐ I ☒ II ☐ III ☐ IV	☒ MANDATORY ☐ DESIRABLE	☐ LOSS ☐ VEHICLE ☒ DAMAGE ☒ SUBSYSTEM ☐ INJURY ☐ PERSONNEL	☐ PREVENTS ☐ MISSION ☐ DEGRADES ☒ MAINTENANCE ☐ RESTRICTS ☐ SYSTEM PERFORMANCE ☒ DELAYS ☐ FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
B.E. FOX, GS-9	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade): FRANK N. LUCERO, GS-13	SIGNATURE: Frank N. Lucero	DATE: 27 Nov 72
PROJECT MANAGER (Typed/printed name and grade): GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE: [illegible]	DATE: 28 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-50-39	DATE 24 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC APU/24000	SUBSYSTEM/WUC Compressor Ducting/24E00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Poor location of APU inlet for unprepared surface operations

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The APU air intake is located on the bottom of the fuselage at approximately fuselage station 560. During unprepared surface operations with the APU on, this location is extremely susceptible to dust and dirt injestion which would probably result in damage and/or failure of the APU. Engine starts at rough field bases would normally be made with APU assist. In addition takeoffs and landings would normally be made with the APU on for safety purposes during this type operation.

LOCAL ACTION

None.

RECOMMENDATION

The APU air intake should be located where susceptibility to dust and dirt injestion is minimized.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] VEHICLE [X] DAMAGE [X] SUBSYSTEM [ ] INJURY [ ] PERSONNEL	[ ] PREVENTS [X] MISSION [X] DEGRADES [ ] MAINTENANCE [ ] RESTRICTS [ ] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
T.R. YECHOUT, Captain	6510TGH/TGES	72588
PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	24 Nov 72
PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE F. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	[illegible signature]	27 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER: 10-51-40 | DATE: 24 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./ SERIAL NO.
Fuel/46000	Internal Fuel Sys/46A00	N/A

DEFICIENCY

Inability to correct fuel imbalance

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

On several occasions the A-10A has experienced fuel imbalances. The present fuel system does not provide a positive capability for correcting fuel imbalances. The fuel unequal procedure in the Flight Manual consists of the following four ste :
(1) Select the engine crossfeed; (2) select the tank gate open; (3) descend to below 10,000 feet MSL; and (4) land as soon as practical.

The engine crossfeed switch interconnects the left and right fuel system. The boost pump supplying the highest pressure feeds both engines. Since the boost pump in the low fuel tank may provide the highest pressure, the imbalance may increase. During the AFFE, the crossfeed switch has not provided relief from fuel imbalances on all occasions.

The tank gate valve interconnects the left and right fuselage fuel tanks. Therefore, it cannot influence a fuel imbalance until after the wing tanks are empty. In addition, the tank gate is extremely attitude sensitive. The tank gate function was tested on a weapons delivery mission. Since the aircraft spent proportionately more time climbing than diving, the aft fuselage tank remained full and the forward tank decreased. The aircraft must be maintained in a straight and level attitude at a low angle of attack to establish an equal fuel level. This system is considered unacceptable to correct fuel imbalances since all maneuvering must be avoided until the situation is corrected and the system is unable to correct imbalances noted in wing tank fuel until the wing tanks are empty.

LOCAL ACTION

Advise all pilots.

RECOMMENDATION Individual control of the left and right system boost pumps should be provided. Two boost pump switches, one for the left wing and left main boost pumps and the other for the right wing and right main boost pumps should be considered. Positions should include an off position so that boost pumps for one fuel system can be turned

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] VEHICLE [X] DAMAGE [ ] SUBSYSTEM [ ] INJURY [ ] PERSONNEL	[ ] PREVENTS [X] MISSION [X] DEGRADES [ ] MAINTENANCE [X] RESTRICTS [X] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
A. WEBB, GS-9	6510TGH/TGES	73642

PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	27 Nov 72

PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G Lynch	28 Nov 72

AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-51-40 CONTINUED:

off while in engine crossfeed to control fuel imbalance problems. Such a system would give the pilot positive control of the fuel system feeding both engines. The tank gate feature should be retained for fuel imbalance situations caused by boost pump failures.

The appropriate information should be included in the Flight Manual.

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-46-41	DATE 30 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Instruments/51000	SUBSYSTEM/WUC Nav Instruments/51G00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Lack of HARS gyro cutoff circuit during maintenance activities.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The aircraft lacks provisions for deenergizing the HARS gyro during ground maintenance with external power applied. Although this has not been a problem with the prototype aircraft, unnecessary run time on the gyro would reduce its life. Pulling circuit breakers for the gyro is not an acceptable alternative.

LOCAL ACTION

None

RECOMMENDATION

An engineering study should be made to determine the feasibility and desirability of a circuit for power shutoff from external power to the HARS gyro and high cost flight instruments. The circuit should include an override switch, ideally located in the cockpit for ground operation when desired.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [ ] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [X] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
C.W. BRANDT, W-10	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 2 DEC 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G Lynch Jr	DATE 5 Dec 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-38-42	DATE 27 Nov 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Fuselage & Cockpit/12000	SUBSYSTEM/WUC Canopy/12C00		COMPONENT PART NO./SERIAL NO N/A	

DEFICIENCY

Poor forward visibility

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The canopy bow and front windscreen supports are approximately 3 1/2 and 2 1/2 inches wide, respectively, and significantly obstruct forward visibility. This limitation is particularly evident during formation flying and weapons delivery roll-ins when the target is momentarily lost.

LOCAL ACTION

None.

RECOMMENDATION

The canopy should be designed for optimum unobstructed vision. Width of structural members in the line of vision should not exceed 2.2 inches (56mm), as specified in MIL-STD-1472A, para. 5.14.1.1.4, but preferably should be smaller.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [X] RESTRICTS [ ] DELAYS [X] MISSION [ ] MAINTENANCE [X] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 27 Nov 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G Lynch Jr	DATE 29 Nov 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)	SER NUMBER: 10-37-43	DATE: 27 Nov 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./SERIAL NO.
Cockpit & Fuselage/12000	Cockpit/12A00	N/A

DEFICIENCY

Unacceptable location of anti-skid switch

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The anti-skid switch is located on the lower left edge of the front instrument panel. Operation of the switch is critical during landing and takeoff emergencies. Anthropometric measurement revealed that this area of the instrument panel is inaccessible to pilots with a functional reach at or below the 20th percentile with shoulder harness locked without straining sideways and forward.

LOCAL ACTION

None.

RECOMMENDATION All controls requiring actuation with shoulder harness locked must be located to ensure operability by the middle 90 percent of all A.F. pilots in accordance with MIL-STD-1472A, para. 5.6.1. Consideration should be given to locating the anti-skid switch on the control stick paddle switch because of its critical function during ground emergencies.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [ ] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] DAMAGE [ ] INJURY [X] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Captain	6510TGH	72491

PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	27 Nov 72

PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G P Lynch J	29 Nov 72

 AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)		SER NUMBER 10-52-44	DATE 2 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC
MAJOR SYSTEM/WUC Flight Controls/14000	SUBSYSTEM/WUC Lateral Control Sys/14C00		COMPONENT PART NO./SERIAL NO. N/A

DEFICIENCY

Poor access to aileron trim actuator

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The aileron trim actuator and artificial feel system device are located forward of the inboard aileron actuator. No panels are provided for these components. Although not yet demonstrated, the aileron actuator access panels W-11 and W-12 would probably have to be removed to gain access to the aileron trim actuator or any part of the artificial feel device to perform maintenance on this system.

LOCAL ACTION

None.

RECOMMENDATION Adequate access should be provided to the aileron trim actuator or this part of the system should be located in a more accessible area in accordance with MIL-STD-1472A, para. 5.9.4.1. Access to the various artificial feel system components should be studied and appropriate action taken.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC X MAINT [ ] RELIABILITY X PTTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [ ] INJURY [ ] PERSONNEL (None)	[ ] PREVENTS X DEGRADES RESTRICTS [ ] DELAYS; [ ] MISSION X MAINTENANCE SYSTEM PERFORMANCE FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	PHONE
B.E. FOX, GS-9	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 2 Dec 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G. Lynch Jr	DATE 5 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)		SER NUMBER 10-56-45	DATE 2 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC
MAJOR SYSTEM/WUC Airframe/11000	SUBSYSTEM/WUC 11G00, Engine Nacelle Assy/11J00		COMPONENT PART NO./SERIAL NO N/A

DEFICIENCY

Large number of fasteners required for engine nacelle access doors

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

In order to open the engine nacelle access doors on each engine, approximately 70 fasteners must be loosened. These consist of both "cross point" and Allen (internal wrenching) fasteners. This is a very time consuming task and is required frequently. Approximately 7 minutes are required for opening the doors on one engine for a preflight or postflight inspection. Appr imately an additional 12 minutes are required to close the doors.

LOCAL ACTION

None.

RECOMMENDATION An engineering study should be conducted to investigate the feasibility of utilizing a latching system (i.e., Hartwell flush latches) which would facilitate door removal and installation in accordance with MIl-STD-1472A, para. 5.9.10.2.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [X] DELAYS — [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT MAINTENANCE [ ] CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER ORIGINATOR (Name and grade)	ORGANIZATION (Office Symbol)	OUT PHONE
B.E. FOX, GS-9	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	2 DEC 72
PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G P Lynch Jr	5 Dec 72

AFFTC FORM 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)	SER NUMBER	DATE
	10-57-46	2 Dec 72

VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
A-10A	71-1369/-1370	AFFTC

SYSTEM/WUC	SUBSYSTEM WUC	COMPONENT PART NO / SERIAL NO
Airframe/11000	Engine Nacelles/11G00,11J00	N/A

DEFICIENCY

Excessive gap at air inlet duct/engine inlet interface

DEFICIENCY CIRCUMSTANCES DESCRIPTION/CAUSES (Continue on separate page if necessary.)

An excessively wide and deep gap (space) exists between the aft face of the nacelle air inlet duct and the forward face of the engine inlet. An air inlet seal is positioned between the two interfacing surfaces; however, the seal is positioned well below the duct inner surface, resulting in a space which could easily retain foreign objects. For example, the retaining nuts on the forward outer spinner could fall into the gap and be overlooked. The basic problem appears to be the design in positioning the duct seal.

INTERIM ACTION

None. Contractor performs inlet inspection prior to engine start.

RECOMMENDATION

The duct seal should be positioned to the same level as the air inlet duct inner surface, thereby eliminating a deep well gap.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

OPS X DESIGN MATERIEL QC MAINT RELIABILITY

SAFETY HAZARD CODE	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
X III IV	X MANDATORY DESIRABLE	LOSS; X DAMAGE; INJURY; VEHICLE; X SUBSYSTEM; PERSONNEL	PREVENTS X MISSION; X DEGRADES MAINTENANCE; RESTRICTS X SYSTEM PERFORMANCE; DELAYS FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

POINT OF CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
E.T. JESTER, MSgt	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	2 DEC 72
PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G. Lynch Jr	5 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	DATE
10-55-47	2 Dec 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./SERIAL NO
Airframe/11000	N/A	N/A

DEFICIENCY

Potential damage to "coin-slotted" screws during removal

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

A substantial number of "coin-slotted" (HTS-High Torque Set, MS-33750) screws are used to secure plates and panels to aircraft structure. Past experience with other aircraft has shown this type of screw head to be very difficult to remove. Removal actions frequently result in damaging the "coin-slot", thus requiring the screw head to be removed by drilling. At times this method will cause damage to the fastener hole in the plate or panel being retained by the screw. The "coin-slotted" screws are utilized in low frequency access doors such as the side fuselage trough areas, wing flight control mechanism access plates, wing to fuselage attach point covers, pylon disconnect covers, etc. Approximately 3,300 "coin-slotted" screws are used throughout the aircraft to secure these plates and panels. These panels are opened only during selected phase inspections or unscheduled maintenance.

LOCAL ACTION

None.

RECOMMENDATION A study should be made to determine the best type of fastener which will not be damaged during removal actions. Consideration should be given to use of MS-33781 "Torque Set" or NAS-1189 Phillips type screws. Screw type for access panels and doors should be standardized if possible.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [X] MATERIEL [ ] QC X MAINT X RELIABILITY X PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY X DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	PREVENTS X DEGRADES RESTRICTS X DELAYS MISSION X MAINTENANCE SYSTEM PERFORMANCE FLIGHT MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	OUT PHONE
B.E. FOX, GS-9	6510TGH	72695

PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS -13	Frank N. Lucero	2 Dec 72

PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G. Lynch Jr	5 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-54-48	DATE 4 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Radio Navigation/71000	SUBSYSTEM/WUC TACAN/71A00		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Difficulty in reading TACAN RT unit indicators

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The TACAN receiver transmitter unit, which is located in the left avionics compartment at approximately fuselage station 320, is equipped with hourmeter, azimuth and nautical miles adjustments. The indicators for these adjustments are difficult to see due to their location behind metal gratings. Also, tl indicator faces cannot be cleaned without removing the RT unit cover.

LOCAL ACTION

None.

RECOMMENDATION

All check points, adjustment points, should be accessible and visible in accordance with MIL-STD-1472A, para. 5.9.4.3.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	OUT PHONE
B.W. COOKE, TSgt	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 4 Dec. 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE	DATE 5 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-58-49	DATE 4 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Radio Navigation/71000	SUBSYSTEM/WUC TACAN/71A00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Difficulty in handling TACAN RT unit for removal and replacement

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The TACAN receiver/transmitter unit, which is located in the left avionics compartment at approximately fuselage station 320, is large and heavy and is not equipped with handles. Due to its location above the ground (approximately 10 feet) personnel must work from a ladder or service stand to perform maintenance on the unit. Removal or replacement of the RT unit is difficult due mainly to the absence of handles to aid in handling.

LOCAL ACTION

None.

RECOMMENDATION

Handles should be installed on the TACAN RT unit to facilitate handling during removal or replacement of the unit in accordance with MIL-STD-1472A, para. 5.9.11.4.1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[ ] MANDATORY [X] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS — [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
B.W. COOKE, TSgt	6510TGH	72695
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 4 DEC. 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G. Lynch	DATE 5 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER	10-59-50	DATE	4 Dec 72	
RELATED SER NUMBERS	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO'S: 71-1369/-1370	TEST LOCATION: AFFTC	
MAJOR SYSTEM/WUC: Airframe/11000	SUBSYSTEM/WUC: N/A	COMPONENT PART NO./SERIAL NO.: N/A		

DEFICIENCY

Crack in structure at F.S. 512 (aft fuel tank bulkhead stiffener)

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

A fatigue crack has developed on the bottom end of a stiffener on the aft side of the aft fuel tank bulkhead, F.S. 512. The crack progressed in an arc around a "Hi Lock" fastener with the lower end of the crack terminating at the end of the stiffener and the upper end terminating approximately 3/4 inch above the fastener as shown in the attached figure. This crack could have been caused by metal fatigue brought on by "built-in stress", or preload, during airframe assembly. The stiffener may have been formed with an incorrect or nonconstant angle thereby causing a preload upon the assembly or the fastener could have been torqued too tight. No evidence of cracking in this area was found on aircraft S/N 71-1370.

LOCAL ACTION

The crack was stop drilled and repaired in accordance with the applicable -3 technical manual.

RECOMMENDATION

This problem should be monitored closely by the contractor and the results reported to the A-X SPO on a periodic basis.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [X] MATERIEL [ ] QC [ ] MAINT [X] RELIABILITY [ ] PSTF

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] DAMAGE [ ] INJURY; [X] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS; [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade): B.E. FOX, GS-9	ORGANIZATION (Office Symbol): 6510TGH	DUTY PHONE: 72695
PROJECT ENGINEER (Typed/printed name and grade): FRANK N. LUCERO, GS-13	SIGNATURE: Frank N. Lucero	DATE: 4 DEC 72
PROJECT MANAGER (Typed/printed name and grade): GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE: [signature]	DATE: 5 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER: 10-28-51	DATE: 4 Dec72		
RELATED SER NUMBERS:	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO(S).: 71-1369/-1370	TEST LOCATION: AFFTC
MAJOR SYSTEM/WUC: Cockpit/12000	SUBSYSTEM/WUC: Canopy/12C00	COMPONENT PART NO./SERIAL NO: N/A	

DEFICIENCY

Poor canopy operation for emergency ground egress

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Ground egress under simulated emergency conditions revealed that canopy operation unnecessarily retards a pilot's ability to escape from the cockpit. Normal (powered) canopy opening takes about 12 seconds which is approximately one half the total time required to exit the cockpit from initiation of egress procedures. Since the pilot must hold the canopy switch in the OPEN position, his ability to perform other required egress procedures simultaneously is hampered, thus delaying his escape.

LOCAL ACTION

None.

RECOMMENDATION

Emergency opening provisions should be available to open the canopy at a faster-than normal rate and without the need to hold the canopy switch during its actuation. Consideration should be given to a switch designed as shown in the following diagram.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] SAFE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [X] INJURY [X] PERSONNEL	PREVENTS MISSION DEGRADES MAINTENANCE X RESTRICTS SYSTEM PERFORMANCE DELAYS X FLIGHT/MAINTENANCE CREW EFFECTIVENESS

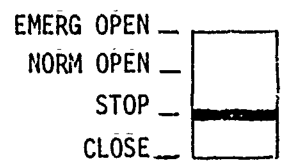
AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*: R.F. ARD, Captain	ORGANIZATION *(Office Symbol)*: 6510TGH/SGUM	OUT PHONE: 72588
PROJECT ENGINEER *(Typed/printed name and grade)*: FRANK N. LUCERO, GS-13	SIGNATURE: Frank N. Lucero	DATE: 4 Dec 72
PROJECT MANAGER *(Typed/printed name and grade)*: GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE: [illegible]	DATE: 5 Dec 72

AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-28-51 CONTINUED:

Normal open and close positions remain spring-loaded to STOP, but selection of EMERG OPEN will not allow switch to return to STOP when hand is released. In addition, canopy opening rate is speeded up. Switch design should incorporate a safeguard against inadvertent selection of EMERG OPEN.



A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-60-52	DATE 4 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Flight Controls/14000	SUBSYSTEM/WUC Manual Reversion/N/A		COMPONENT PART NO./ SERIAL NO. N/A	

DEFICIENCY

Inadequate switchover to and from manual reversion mode

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Double engine flameouts or complete loss of both hydraulic systems cause a loss of lateral axis control until the aileron drive switch is placed in DRIVE TAB and the actuators complete the shift from the DRIVE AILERON to the DRIVE TAB position. During double engine flameouts, hydraulic pressure is reduced almost immediately to zero when engine core speed passes through 40 percent. (SER 10-6-2) Two problems are presented. First, the aileron drive switch on the prototypes is located on the left rear console beside the pilot seat. The pilot must remove his attention from the primary flight instruments and outside attitude of the aircraft and direct it toward activation of this switch which results in a lapse of pilot attention to the immediate condition of the aircraft. Second, should an engine be restarted, hydraulic power is again present and the elevator and rudder automatically revert back to the powered mode; however, lateral control is prevented until the aileron drive switch is repositioned to DRIVE AILERON. During this interval an aileron out-of-trim condition will result in a rapid rolling motion which is virtually uncontrollable in the DRIVE TAB position. Lateral trim inputs are effective while hydraulic power is present; however, this alone is not acceptable for aircraft control. This action may also be prevented by actuating the T.O. Trim Button to retrim the ailerons prior to the return of hydraulic power; however, in a double engine flameout situation the exact time of engine restart cannot be predicted. Should the restart occur while the aircraft is close to the ground, loss of vehicle and pilot could result from loss of lateral control.

LOCAL ACTION

Revise Flight Manual to reflect this problem.

RECOMMENDATION The addition of a hydraulic ON/OFF switch should be considered as a solution to the problem. With windmill hydraulics available (reference SER 10-6-2) and a hydraulic ON/OFF switch the pilot could control the entry into and out of manual reversion during the double engine flameout situation.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [X] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[X] LOSS [X] VEHICLE [X] DAMAGE [ ] SUBSYSTEM [X] INJURY [X] PERSONNEL	[X] PREVENTS [X] MISSION [X] DEGRADES [ ] MAINTENANCE [ ] RESTRICTS [ ] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

Code III applies if the aircraft is close to the ground.

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	OUT'L PHONE
T.R.YECHOUT/R.D. BRIDGES, JR., Captains	6510TGH	72588
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 4 DEC 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G. Lynch Jr	DATE 5 Dec 72

AFFTC FORM AUG 72 2

RECOMMENDATION SER NUMBER 10-60-52 CONTINUED:

If feasible, the switch should combine the action of the TAB/AILERON DRIVE switch with the hydraulic shutoff feature. The functions should be carefully combined to allow completion of the shift from DRIVE AILERON to DRIVE TAB prior to the shutdown of windmill hydraulic power. It should also allow for completion of the shift from DRIVE TAB to DRIVE AILERON and provide for a return to T.O. trim prior to opening the hydraulic shutoff valves. The shift to manual reversion would be accomplished by this single switch whether loss of hydraulics resulted from a double engine flameout or hydraulic system failure. This combination of functions would assure proper conversion to and from manual control and would eliminate the possible loss of control problems inherent in the present system.

The hydraulic ON/OFF switch would also allow operational pilots to experience the characteristics of the manual reversion system prior to encountering a serious in-flight emergency requiring its use. Much consideration should be given to this training feature since control in the manual reversion mode has been demonstrated to be marginal during precision flight maneuvers such as required for a successful landing. The trim changes encountered upon initiation of manual reversion are also significant and should be experienced by each A-10 pilot. (Reference AFFE A-10A Performance and Flying Qualities Report)

The manual reversion switch(s) should be located on or near the instrument panel within each reach of the pilot and in a position which would not require the pilot's attention to be distracted from the immediate condition of the aircraft.

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER: 10-61-53
DATE: 4 Dec 72

RELATED SER NUMBERS	VEHICLE TYPE	VEHICLE SERIAL NO(S).	TEST LOCATION
	A-10A	71-1369/-1370	AFFTC

MAJOR SYSTEM/WUC	SUBSYSTEM/WUC	COMPONENT PART NO./SERIAL NO.
Landing Gear/13000	Brakes/13L00	N/A

DEFICIENCY

Loss of normal braking system with both electrical systems inoperative

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

With both electrical systems inoperative, normal brake pressure from the No. 1 hydraulic system was not available. The emergency brake handle had to be pulled in order to restore braking authority. This was due to the design of the landing gear control valve which was controlled by the landing gear handle in the cockpit. The valve was solenoid actuated and directed hydraulic pressure from system No. 1 for retraction and extension of the gear and normal braking. With both electrical systems shutdown, the valve was inoperative. The requirement to use the emergency braking system should be limited only to situations where the No. 1 hydraulic system or both hydraulic systems are inoperative. For example, a landing made with the left generator and right engine out would place the aircraft in a situation where the only brake pressure available was that supplied by the emergency brake accumulator which has a limited number of applications. The No. 1 hydraulic system would be functioning properly but yet could not supply brake pressure due to design of the valve. Also, the valve could be rendered inoperative by other electrical system malfunctions (i.e., broken wires at various critical locations).

LOCAL ACTION

The Flight Manual was revised to reflect the problem.

RECOMMENDATION

The landing gear control valve should be redesigned to operate with both electrical systems shutdown.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] DAMAGE [ ] INJURY [X] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [ ] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
T.R. YECHOUT, Captain	6510TGH/TGES	72588

PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	4 DEC 72

PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G Lynch Jr	5 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-62-54	DATE 6 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Turbo-Fan/27000	SUBSYSTEM/WUC Fuel System/27L00		COMPONENT PART NO./ SERIAL NO. 6021T66P04	

DEFICIENCY

Restricted access for fuel control removal/installation

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Restricted access is available to the fuel control during its removal and installation During removal, the variable geometry vane feedback cable clevis and the "Blue" electrical cable connector cannot be disconnected until the fuel control is moved away from its mount pad. This requires one man to move and hold the fuel control while another disconnects the clevis and electrical connector. During installation, two men are required to connect these items until the control is clamped to its mount pad. This deficiency results in increased change time of the fuel control, requires two men to accomplish the tasks, and could result in damage to the cable and connector.

LOCAL ACTION

None.

RECOMMENDATION

Adequate access should be provided to the cable clevis and electrical connector in accordance with MIL-STD-1472A, para., 5.9.4.1. Only one man should be required to remove and install the fuel control.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY X PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] VEHICLE [X] DAMAGE [X] SUBSYSTEM [ ] INJURY [ ] PERSONNEL	[ ] PREVENTS [ ] MISSION [X] DEGRADES [X] MAINTENANCE [ ] RESTRICTS [ ] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT *(Name and grade)*	ORGANIZATION *(Office Symbol)*	DUTY PHONE
E.T. JESTER, MSgt	6510TGH	72695
PROJECT ENGINEER *(Typed/printed name and grade)* FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 12 DEC 72
PROJECT MANAGER *(Typed/printed name and grade)* GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G. Lynch	DATE 12 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-65-55	DATE 2 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S): 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Turbo Fan / 27000	SUBSYSTEM/WUC Combustor Section/27C00		COMPONENT PART NO./SERIAL NO: N/A	

DEFICIENCY

Excessive carboning of engine carbureting scrolls.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Carboning (coking) of carbureting scrolls occurs in the YTF34-F5 engines to the extent that a scheduled periodic inspection of the combuster liner fuel scrolls ("huffer-puffer" check) is required every twenty-five (25) hours of operating time. This rapid carbon buildup has become prominent in the AX aircraft YTF34 engine which burns JP-4 fuel. Carbon buildup (coking) accumulates in and around the scroll discharge ports and is the result of improperly burned fuel. This rapid buildup of carbon would affect the properties of a correct flame pattern and if not monitored or removed could result in damage to or failure of the combuster liner. The deficiency of excessive scroll carboning is further compounded by the manhours required each twenty-five (25) hours of engine operation to monitor and clean. The periodic inspection requires an estimated twelve (12) manhours (two men, six clockhours) and cleaning requires an estimated forty-eight manhours. This sixty maintenance manhour expenditure equates to eighteen (18) clockhours of aircraft downtime for each engine per twenty-five (25) hours of engine operating time. This manhour to flying hour ratio is totally unacceptable. Cause is unknown. It is suspected that the basic design of fuel tubes, carbureting scrolls, and combuster liner was optimized for JP-5 fuel and incompatibility with JP-4 fuel causes the above problem.

LOCAL ACTION

None

RECOMMENDATION

The engine contractor should conduct a study of combustor liner fuel scrolls to determine necessary corrective action to eliminate carboning deficiency.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [X] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] VEHICLE [X] DAMAGE [X] SUBSYSTEM [ ] INJURY [ ] PERSONNEL	[ ] PREVENTS [X] MISSION [X] DEGRADES [X] MAINTENANCE [ ] RESTRICTS [X] SYSTEM PERFORMANCE [ ] DELAYS [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
E.T. Jester, MSgt	6510 TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 12 DEC 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G P Lynch Jr	DATE 12 Dec 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER	DATE
			10-66-56	5 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Propulsion/29000	SUBSYSTEM/WUC Engine Starting Sys/29J00		COMPONENT PART NO./SERIAL NO. NA	

DEFICIENCY

Engine overtemperature during airstarts with throttles forward of idle

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Initiation of cross bleed assist to airstart an engine required positioning the throttle against the idle stop. If the throttle was slightly forward of the stop, cross bleed assist for starting could not be obtained, even though ignition and fuel flow were properly scheduled. In this configuration the engine was essentially in a windmill airstart mode. This design resulted in several hot start attempts when the pilot inadvertently did not have the throttles against the idle stop and was outside the windmill start envelope. The cause of unsuccessful attempts was closing of the air turbine starter (ATS) control valves with throttles forward to idle. With these valves closed no starter assistance from the operating engine was available.

LOCAL ACTION

Pilots insured that throttles were at idle stop for cross bleed airstarts.

RECOMMENDATION

The ATS control valves should open during start attempts with throttles forward of idle.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[X] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [X] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] DAMAGE [ ] INJURY [ ] VEHICLE [X] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [ ] MISSION [ ] MAINTENANCE [X] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
A. WEBB	6510TGH/TGES	73518
PROJECT ENGINEER (Typed/printed name and grade)	SIGNATURE	DATE
FRANK N. LUCERO, GS-13	Frank N. Lucero	12 Dec 72
PROJECT MANAGER (Typed/printed name and grade)	SIGNATURE	DATE
GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	G. P. Lynch	12 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-53-57	DATE 14 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Radio Navigation/71000	SUBSYSTEM/WUC TACAN/71A00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Inadequate marking of TACAN suppressor cables and RT unit

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES (Continue on separate page if necessary.)

The "J-104 Suppressor in" and "J-105 Suppressor out" cables and transducers are inadequately identified. It is quite easy to install these cables backwards which would result in damage to the system.

LOCAL ACTION

None.

RECOMMENDATION

The cables and RT unit should be marked in a manner that will preclude installing the cables backwards in accordance with MIL-STD-1472A, para. 5.9.13.9.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [X] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [X] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] DAMAGE [ ] INJURY [ ] VEHICLE [X] SUBSYSTEM [ ] PERSONNEL	[ ] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
B.W. COOKE, TSgt	6510TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 18 Dec 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 18 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)

SER NUMBER: 10-67-58	DATE: 14 Dec 72		
RELATED SER NUMBERS:	VEHICLE TYPE: A-10A	VEHICLE SERIAL NO(S).: 71-1369/-1370	TEST LOCATION: AFFTC
MAJOR SYSTEM/WUC: Weapons Delivery/75000	SUBSYSTEM/WUC: Pylons/75W00	COMPONENT PART NO./SERIAL NO.: N/A	

DEFICIENCY

Inadequate access to electrical connectors in pylons 3, 4, 7, 8 and 9

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

In order to troubleshoot the weapons release and jettison circuit to the MAU-40 bomb racks on wing pylon stations 3, 4, 7, 8 and 9, it is necessary to have access to the electrical connectors. To troubleshoot the circuit, the connectors will have to be disconnected from the MAU-40 bomb racks. There are no access panels to these connectors. The only way to obtain access is to remove the MAU-40 bomb racks and then disconnect the connectors. In removing the bomb racks approximately thirty (30) extra man-minutes will be consumed in the removal and reinstallation of each rack.

LOCAL ACTION

None.

RECOMMENDATION

Access panels should be provided to the electrical connectors on all pylon stations in accordance with MIL-STD-1472A, para. 5.9.4.1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] P3TE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS — [ ] MISSION [X] MAINTENANCE [ ] SYS PERFORMANCE FLIGHT MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade): M.L. GREEN, TSgt	ORGANIZATION (Office Symbol): 6510TGH	PHONE: 72695
PROJECT ENGINEER (Typed/printed name and grade): FRANK N. LUCERO, GS-13	SIGNATURE: Frank N. Lucero	DATE: 18 Dec 72
PROJECT MANAGER (Typed/printed name and grade): GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE: [illegible]	DATE: 18 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)		SER NUMBER 10-68-59	DATE 5 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S): 71-1369/-1370	TEST LOCATION AFFTC
MAJOR SYSTEM/WUC Weapons Delivery/75000	SUBSYSTEM/WUC Pylons/75W00	COMPONENT PART NO./SERIAL NO. NA	

DEFICIENCY

Lack of access panels on wing pylons 1 and 11

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

In order to perform a visual inspection of the MAU-50A bomb racks on stations 1 and 11, the bomb racks will have to be removed from their fixed pylon locations. There are no access inspection panels on these wing stations.

LOCAL ACTION

NONE

RECOMMENDATION

Access inspection panels should be installed on wing pylon stations 1 and 11 in accordance with MIL-STD-1472A, para 5.9.4.1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [X] DESIGN [ ] MATERIEL [ ] QC [X] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] DAMAGE [ ] INJURY [ ] VEHICLE [ ] SUBSYSTEM [ ] PERSONNEL (None)	[ ] PREVENTS [ ] DEGRADES [X] RESTRICTS [ ] DELAYS [ ] MISSION [X] MAINTENANCE [ ] SYSTEM PERFORMANCE [ ] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
M.L. GREEN, TSgt	6510 TGH	72695
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 12 DEC 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE	DATE 12 DEC 72

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)		SER NUMBER 10-69-60	DATE 12 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369/-1370	TEST LOCATION AFFTC
MAJOR SYSTEM/WUC Landing Gear/13000	SUBSYSTEM/WUC Brakes/13L00	COMPONENT PART NO./SERIAL NO. NA	

DEFICIENCY

Loss of normal and emergency braking with anti-skid malfunction.

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Certain malfunctions of the anti-skid system will cause a loss of both normal and emergency braking. This was experienced during task II. Braking could be regained by turning the anti-skid off. However, when normal braking is lost the pilot's first reaction usually is to pull the emergency brake handle especially if the braking loss is experienced during a critical phase of ground taxi. In the present configuration this action would require several seconds and delay positive corrective action.

LOCAL ACTION

None

RECOMMENDATION

The emergency brake system should be redesigned to supply emergency brake whenever activated and should not be affected by the anti-skid system

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [ ] OPS [XX] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[ ] I [ ] II [XX] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [X] DAMAGE [X] INJURY — [X] VEHICLE [ ] SUBSYSTEM [X] PERSONNEL	[X] PREVENTS [X] DEGRADES [ ] RESTRICTS [ ] DELAYS — [ ] MISSION [ ] MAINTENANCE [X] SYSTEM PERFORMANCE [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	OUT PHONE
YECHOUT, T.R., Captain	6510 TGH/TGES	72588
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 12 Dec 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G. Lynch Jr	DATE 12 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-70-61	DATE 14 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S): 71-1369/-1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Cockpit & Fuselage/12000	SUBSYSTEM/WUC Cockpit/12A00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Poor access (beyond reach) to forward cockpit control surfaces

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

Several cockpit control surfaces are beyond the functional reach of the fifth percentile pilot. These include surfaces on the left console forward of the throttle quadrant, presently housing auxiliary engine and emergency flight controls, and the respective portion of the right console housing electrical controls. The lower half of the instrument panel, containing landing gear, stores management, HSI, and fuel controls, is similarly inaccessible. Pilot-cockpit interface efficiency is severely degraded by resulting inordinate reach requirements. Reduced efficiency results in additional pilot fatigue on long duration/high workload missions which degrades safety and mission effectiveness.

LOCAL ACTION

None.

RECOMMENDATION

All controls shall be within the functional reach of a fifth percentile pilot in accordance with MIL-STD-1472A, para. 5.6.1.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

☐ FUNCTIONAL ☒ OPS ☒ DESIGN ☐ MATERIEL ☐ QC ☐ MAINT ☐ RELIABILITY X PSTE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
☐ I ☒ II ☐ III ☐ IV	☒ MANDATORY ☐ DESIRABLE	☐ LOSS ☐ DAMAGE ☐ INJURY ☐ VEHICLE ☐ SUBSYSTEM ☐ PERSONNEL (None)	☐ PREVENTS ☒ DEGRADES ☐ RESTRICTS ☐ DELAYS ☐ MISSION ☐ MAINTENANCE ☐ SYSTEM PERFORMANCE ☒ FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.F. ARD/R.D.BRIDGES,JR., Captains	6510TGH	73642
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 15 Dec 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE F. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE [signature]	DATE 17 Dec 72

AFFTC FORM AUG 72 2

A-X PROTOTYPE SYSTEMS EVALUATION REPORT (SER)			SER NUMBER 10-71-62	DATE 14 Dec 72
RELATED SER NUMBERS	VEHICLE TYPE A-10A	VEHICLE SERIAL NO(S). 71-1369 / -1370	TEST LOCATION AFFTC	
MAJOR SYSTEM/WUC Lighting System/44000	SUBSYSTEM/WUC Exterior Lighting/44A00		COMPONENT PART NO./SERIAL NO. N/A	

DEFICIENCY

Lack of formation lights on forward fuselage

DEFICIENCY CIRCUMSTANCES/DESCRIPTION/CAUSES *(Continue on separate page if necessary.)*

The A-10A formation lights consisted of one shielded white light on each vertical tail which illuminated the outboard tail surfaces. The tail and wingtip position lights provided additional formation references. The location of the lights provided three lights which the wingman could see in the normal wing position; however, they were located in an essentially straight line which did not provide good depth perception for the wingman. In addition, the area forward of the wingtips was dark.

LOCAL ACTION

None.

RECOMMENDATION Considering the design mission of the aircraft, the formation references should be optimized. One additional pair of formation lights should be located on the forward fuselage to illuminate the "star" area or below the wingtips to illuminate the outboard pylon areas. This new pair of lights would provide additional perspective to the wingman and will enhance safety of night formation operations.

RECOMMENDATION/DEFICIENCY CLASSIFICATION AND MISSION IMPACT

[ ] FUNCTIONAL [X] OPS [X] DESIGN [ ] MATERIEL [ ] QC [ ] MAINT [ ] RELIABILITY [ ] PETE

SAFETY HAZARD CODE (MIL-STD-882)	CORRECTION CATEGORY	POTENTIAL HAZARD	MISSION IMPACT
[X] I [ ] II [ ] III [ ] IV	[X] MANDATORY [ ] DESIRABLE	[ ] LOSS [ ] VEHICLE [ ] DAMAGE [ ] SUBSYSTEM [ ] INJURY [ ] PERSONNEL (None)	[ ] PREVENTS [ ] MISSION [X] DEGRADES [ ] MAINTENANCE [ ] RESTRICTS [ ] SYSTEM PERFORMANCE [ ] DELAYS [X] FLIGHT/MAINTENANCE CREW EFFECTIVENESS

AMPLIFICATION/OTHER

SER CONTACT (Name and grade)	ORGANIZATION (Office Symbol)	DUTY PHONE
R.D. BRIDGES, JR., Capt	6510TGH	72491
PROJECT ENGINEER (Typed/printed name and grade) FRANK N. LUCERO, GS-13	SIGNATURE Frank N. Lucero	DATE 15 Dec 72
PROJECT MANAGER (Typed/printed name and grade) GEORGE P. LYNCH, JR., Major, USAF Director, A-X Joint Test Force	SIGNATURE G P Lynch Jr	DATE 19 Dec 72

AFFTC FORM AUG 72 2

APPENDIX IV
RELIABILITY AND MAINTAINABILITY DATA ACQUISITION PROCEDURES AND RESULTS

GENERAL

The test results submitted to the Source Selection Advisory Council on reliability and maintainability are contained in this appendix.

OPERATIONAL DATA SYSTEM

Reliability data were collected by use of the Aircraft Debriefing Record (AFFTC Form 0-294), figure 1. A systems engineer recorded the pilot's analysis of subsystem deficiencies and malfunctions that occurred during a flight on this form.

Next the forms were keypunched and entered into the reliability master history file. A computerized listing of all data provided a quantitative summary of subsystem flight-discovered discrepancies (FDD).

MAINTENANCE DATA SYSTEM

Maintainability data were collected by use of the Maintenance Discrepancy/Production Credit Record (AFSC Form 258), figure 2, which was completed by the MET. The AFSC form was filled out according to instructions in AFSC Maintenance Technical Directive 69-1 (reference 7) modified specifically for this AFFE.

After the forms were completed they were edited, keypunched, and put through a validation program which checked for errors that had not been previously detected or which had been introduced during keypunching. Computerized cards were output from this program in AF Form 349 (Maintenance Data Collection Record) format and sent to AFHRL/ASD at Wright-Patterson AFB for use in determining maintenance skill levels required to support an A-X. Next the data were stored on a maintenance master history file. Since these maintenance actions were not grouped as a complete maintenance event (all maintenance actions pertaining to a particular malfunction were considered a maintenance event) they were "bridged" together into one corrective maintenance event. By use of this technique, a much more detailed analysis was possible than would have been permitted using standard maintenance data collection procedures as defined by AFM 66-1. This new maintenance master history file permitted the maintainability analysis presented in this report.

TYPE

AIRCRAFT DEBRIEFING RECORD

CARD NO	1. AIRCRAFT TYPE	2. ID SERIAL NO.	3. MISSION NO.	4. DATE (DAY, MONTH, YEAR)	5. T.O. TIME (HOURS, MIN)	6. DURATION (HOURS, MIN)	7. TYPE MISSION	8. MSN EFFECT	9. LANDINGS
10	A–	A							

10 ENG START (HRS, MINS)	11 ENG STOP (HRS, MINS)	12 GROSS WT (1000 LBS)	13 BASIC WT (1000 LBS)	14 EXTERNAL STORES (1000 LBS)	15. T.O. CG	16 FUEL WT (1000 LBS)	17 ROUNDS FIRED

CARD NO	18 PILOT	19 CHASE	20.
11			

CARD NO	BLOCK NO.	REL CODE	SYSTEM NAME	CARD NO	BLOCK NO	REL CODE	SYSTEM NAME
20	21		Airframe	20	51		UHF Comm
	22				52		Inter Phone
	23		Cockpit		53		TACAN
	24				54		Heading & Reference System
	25				55		IFF/SIF
	26		Landing Gear		56		
	27				57		
	28		Brakes		58		Optical Sight
	29				59		Gun
	30		Flight Controls		60		Gunsight Camera
	31				61		
	32				62		Weapons Delivery
	33				63		
	34		SAS		64		Emergency Equipment
	35		Engines		65		
	36		APU		66		Personnel Equipment
	37		ECS		67		
	38		Electrical Power		68		
	39		Lighting		69		Explosive Devices
	40				70		
	41				71		
	42		Hydraulic Power		72		Instrumentation & Data Recording
	43				73		
	44		Fuel		74		
	45		Oxygen		75		
	46		Misc Utilities		76		
	47				77		
	48				78		
	49		Instruments		79		
	50				80		

MISSION OBJECTIVES

30 THRU 39

SIGNATURE OF AIRCRAFT COMMANDER | SIGNATURE OF DEBRIEFER

CODE FOR BLOCKS AS INDICATED

BLOCK 7 (TYPE MISSION)	BLOCK 8 (MISSION EFFECTIVENESS)	RELIABILITY CODES
01 TRANSITION OR TRAINING	1. FLOWN AS BRIEFED	1. OPERATED SATISFACTORY
02 TEST SUPPORT	2. MISSION DEVIATION	2. DEGRADED OPERATION–NEW DISCREPANCY
03 OTHER SUPPORT	3 AIR ABORT	3. FAILED BUT NO ABORT–NEW DISCREPANCY
04 SYSTEM TEST	4. GROUND ABORT	4. FAILED CAUSING ABORT–NEW DISCREPANCY
05 PERFORMANCE TEST	5. FLOWN AS BRIEFED & ADDITIONAL EVALUATION PERFORMED	5. USED BUT DEGRADED–UNCLEARED DISCREPANCY
06 STABILITY & CONTROL TEST	NOTE: MISSIONS CHANGED FOR OTHER THAN MAINTENANCE ARE CODED 1.	6. USED BUT DEGRADED–ENGINEERING DEFICIENCY
07 RELIABILITY DEMONSTRATION		7. UNUSEABLE–UNCLEARED DISCREPANCY
08 FUNCTIONAL CHECK FLIGHT		8. UNUSEABLE–ENGINEERING DEFICIENCY
		BLANK – EQUIPMENT NOT USED

AFFTC FORM MAY 72 0-294 PREVIOUS EDITIONS WILL BE USED.

Figure 1 AFFTC Form 0-294

DISCREPANCIES						BLOCKS MUST BE FILLED IN AT DEBRIEFING				
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										
JOB CONTROL NUMBER	WORK UNIT CODE	HOW MAL	ACT TAKEN	SAFE CODE	WHEN DISC	BITE	TIME TO FAIL HRS	MIN	MACH	ALT X 100
DESCRIPTION OF DISCREPANCIES										

WHEN DISC'D CODE	1	2	3	4	5	6	7	8	9
[illegible]	START & PRE-TAXI	TAXI	TAKE OFF & ACCEL	CLIMB	CRUISE	COMBAT & WPN DEL	RETURN	TRAFFIC PATTERN & LANDING	TAXI & SHUTDOWN

Figure 1 AFFTC Form 0-294 (Backside)

Form Approved
Budget Bureau No. 21-R251

10	A. JOB CONTROL NUMBER	B. PRI	C. TIME SPEC REQD	D. WORK AREA	E. ESTIMATED MANHOURS	F	1. COPY NR U / 2. REPORT NUMBER Nº 178276
	3. BASIC WORK CENTER	4. ITEM IDENTIFICATION			5. SERIAL NUMBER	6. TIME CYCLES MILES	7. WHEN DISCOVERED TIME *(Day-Mo-Yr-Hours)*
	8. DATE THIS REPORT *(Day-Mo-Yr)*	9. WORK ORDER NUMBER			10. ORIG REPORT NUMBER	11. WHEN DISC CODE	12. ENG POSN NO / 13. ACTIVITY IDENT

20	FAILED ITEM					
	14. MANUFACTURER	15. NOUN - ENGINE TYPE-MODEL SERIES MOD	16. SERIAL NUMBER	17. TIME CYCLES/MILES	18. PART NUMBER	
	19. WORK UNIT CODE	20. SYMBOL	21. HOW MAL	22. FEDERAL SUPPLY CLASS	23.	24.

30	INSTALLED ITEM				
	25. MANUFACTURER	26. NOUN - ENGINE TYPE MODEL SERIES MOD	27. SERIAL NUMBER	28. TIME CYCLES/MILES	29. PART NUMBER

40 THRU 49	G. SUPPLY DOCUMENT NUMBER *(Issue or Demand)*	30. DESCRIPTION OF DISCREPANCY OR MAINTENANCE REQUIRED
		H. DISCOVERED BY

	31. PRE FIX	AFSC	SUF	NR	32. START	33. STOP	34. DELAY CODE	35. START	36. STOP	37. DELAY CODE	38. WORK UNIT CODE	39. ASSISTING WORK CENTER	40. UNITS	41. A.T
50														
51														
52														
53														
54														
55														
56														
57														
58														
59														

60	42. T.O. NUMBER	43. T.O. DATE *(Day-Mo-Yr)*	44. T.O. PROCEDURE	45. TOOLS/AGE	I. CORRECTED BY
61 THRU 69	46. CORRECTIVE ACTION				J. INSPECTED BY

K. SUPERVISOR	L. RECORDS ACTIONS ☐ UNCLEAR DISCREPANCY ☐ REPLACEMENT TIME CHANGE ☐ DATA TRANSCRIBED TO RECORDS	M. DATE TRANSCRIBED *(Day-Mo-Yr)*	N. TRANSCRIBED BY

AFSC FORM JAN 66 258 — PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. — MAINTENANCE DISCREPANCY/PRODUCTION CREDIT RECORD

Figure 2 AFSC Form 258

	47. PIECE PARTS REPLACED DURING REPAIR									
	PART NUMBER	NOUN	WORK UNIT CODE	CIRCUIT SYMBOL	TYPE FAILURE		QTY	HOW MAL	MANUFACTURER	FSC
					PRI	SEC				
70										
T										
H										
R										
U										
79										

CODING TO BE IN BLOCKS AS INDICATED

BLOCK 34 AND 37 DELAY CODES

S AWAITING SUPPLIES AND/OR PARTS
C DELAY DUE TO CONFLICTING MAINTENANCE
A WORK STOPPAGE – NON-POWERED AGE OR RPIE
E WORK STOPPAGE – POWERED AGE OR RPIE
F FLYING
P AWAITING PERSONNEL ASSISTANCE
R ENGINE RUN-UP
T AWAITING TRANSPORTATION
X DELAY FOR WEATHER
K DELAY FOR SPECIAL TEST EQUIPMENT
M PREPLANNED MAINTENANCE DELAY

BLOCK 41 ACTION CODES

1. SERVICING
2. UNSCHEDULED MAINTENANCE
3. PREFLIGHT INSPECTION
4. POSTFLIGHT INSPECTION
5. HOURLY POSTFLIGHT
6. PERIODIC INSPECTION
7. SPECIAL INSPECTION
8. INDEPENDENT
9. RESEARCH AND DEVELOPMENT

BLOCK 44 T.O. PROCEDURE CODES

1. ADEQUATE
2. INADEQUATE
3. INCOMPLETE
4. MISIDENTIFIED
5. NOT AVAILABLE
6. INCORRECT INFORMATION
7. OTHER

BLOCK 45 TOOLS/AGE CODES

1. TOOLS ADEQUATE
2. TOOLS INADEQUATE
3. TOOLS NOT AVAILABLE
4. TEST EQUIPMENT ADEQUATE
5. TEST EQUIPMENT INADEQUATE
6. TEST EQUIPMENT NOT AVAILABLE
7. TOOLS AND TEST EQUIPMENT ADEQUATE
8. TOOLS AND TEST EQUIPMENT INADEQUATE
9. TOOLS AND TEST EQUIPMENT NOT AVAILABLE

* GPO : 1966 O—799-591

AFSC (AAFB)

Figure 2 AFSC Form 258 (Backside)

AX AIR FORCE EVALUATION TEST RESULTS

CATEGORY: A-10A Systems Evaluation	DATE: 12 December 1972
TEST: Reliability Evaluation	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

The Systems Engineers utilized the AFTO Form 0-294 to record aircraft debriefing information for each flight. Data were collected during Task II (October 10, 1972 to November 30, 1972). The Systems Effectiveness Data System (SEDS) was used to process the data. The following definitions were adopted:

1. A flight began once the pilot had signed for the aircraft and ended when he released it back to maintenance.
2. A mission was a flight, not including ground aborts or functional check flights.
3. A flight discovered discrepancy (FDD) was a malfunction of an aircraft subsystem or component discovered during a flight.. All other malfunctions were referred to as ground crew discovered discrepancies.

A-10A TEST RESULTS:

A total of 43 FDD's were observed during Task II. The attached table summarizes the reliability of the A-10A. During Task II the A-10A accumulated 128.0 flight hours (FH) in 84 flights with an average FDD per flight of 0.51. The problem areas were the heading and reference system (HARS), fuel quantity system and the engines. The HARS and the fuel quantity system never worked satisfactorily throughout Task II.

AFFTC Form 0-592 (One Time) Oct 72 Expires 31 Dec 1972

A-10A

System	FDD	(FH) Flight Hours	(FLT) Flights	FDD/FH	FDD/FLT	FDD Percent of Total	
Airframe	0	128.0	84	0	0	--	
Cockpit/Fuse Compart	3			0.02	0.04	7.0	
Landing Gear	3			0.02	0.04	7.0	
Brakes	2			0.02	0.02	4.6	
Flt Controls	3			0.02	0.04	7.0	
Engines	17			0.13	0.20	39.6	
APU	0			0	0	--	
ECS	3			0.02	0.04	7.0	
Elec Pwr	0			0	0	--	
Lighting	0			0	0	--	
Hydraulic Pwr	0			0	0	--	
Fuel	*	THIS SYSTEM DID NOT FUNCTION PROPERLY DURING TASK II					
Oxygen	0			0	0	--	
Misc Utilities	1			0.01	0.01	2.3	
Instru-ments	3			0.02	0.04	7.0	
SAS	2			0.02	0.02	4.6	
UHF Comm	0			0	0	--	
Inter-phone	0			0	0	--	
IFF/SIF	0			0	0	--	
HARS	*	THIS SYSTEM DID NOT FUNCTION PROPERLY DURING TASK II					
TACAN	1			0.01	0.01	2.3	
Fire Control	2	69.8	46	0.02	0.04	4.6	
Weapons Delivery	3	69.8	46	0.02	0.07	7.0	
Personnel Equip	0	128.0	84	0	0	--	
A-10A TOT	43	128.0	84	0.34	0.51	100.0	

AX AIR FORCE EVALUATION TEST RESULTS	
CATEGORY: A-10A Systems Evaluation	DATE: 14 December 1972
TEST: Maintainability Evaluation	SSEB RECEIPT:
	LOG NUMBER:

DETAILED TEST CONDITION OR GOAL:

Since the contractor maintained his own aircraft, a combined AFLC, AFSC, and TAC maintenance evaluation team (MET) was utilized to record the contractor's work. The tasks observed were recorded on AFSC Form 258. These forms were collected from 10 October to 30 November 1972. The Systems Effectiveness Data System (SEDS) was used to process the data.

A-10A TEST RESULTS:

The MET recorded for all maintenance work both the time it took the contractor to perform a maintenance task and a prediction for the time it would take Air Force personnel to accomplish the identical task.

Though the MET did not observe every maintenance task, from the sample that was gathered, the engines accounted for 93.9 of 156 observed maintenance man-hours (MMH). The MMH expended by the contractor for repair of the A-10A was reported by the maintenance team to be representative of the repair time needed by Air Force personnel to perform the same work as can be seen by comparing the actual and expected unscheduled maintenance times.

Scheduled maintenance time was modeled for the actual time consumed by the contractor as well as for the corresponding MET predicted times since not all scheduled maintenance tasks were observed. Using the sample of actual times and the Task II average flight time of 1.6 hours, scheduled maintenance time was estimated to be 7.5 MMH/FH. Predicted scheduled maintenance times were simulated using MET predicted maintenance times for a mature aircraft flying a 1.8 hour average mission.

See the attached tables for a complete listing of data.

A-10A UNSCHEDULED MAINTENANCE

System	Maint Events	Active Hours	Mean Time to Repair	Actual MMH	MMH / Event	Actual MMH / FH	Expected MMH / FH
Airframe	0	0	-	0	0	0	0
Cockpit/Fuse Compartment	0	0	-	0	0	0	0
Landing Gear	4	14.7	3.7	38.9	9.7	0.3	0.3
Brakes	0	0	-	0	0	0	0
Flt Controls	0	0	-	0	0	0	0
Engines	5	42.4	8.4	93.9	18.8	0.7	0.7
APV	0	0	-	0	0	0	0
ECS	2	4.0	2.0	5.6	2.8	0.0	0.0
Elec Pwr	1	3.0	3.0	3.4	3.4	0.0	0.0
Lighting	0	0	-	0	0	0	0
Hydraulic Pwr	0	0	-	0	0	0	0
Fuel	*	THIS SYSTEM DID NOT FUNCTION PROPERLY DURING TASK II					
Oxygen	0	0	-	0	0	0	0
Instrumentation	0	0	-	0	0	0	0
Misc Utilities	1	2.2	2.2	4.4	4.4	0.0	0.0
Instruments	4	0.8	0.2	0.9	0.2	0.0	0.0
SAS	1	2.3	2.3	6.9	6.9	0.1	0.1
UHF Comm	0	0	-	0	0	0	0
Interphone	0	0	-	0	0	0	0
IFF/SIF	0	0	-	0	0	0	0
HARS	*	THIS SYSTEM DID NOT FUNCTION PROPERLY DURING TASK II					
TACAN	0	0	-	0	0	0	0
Fire Control	0	0	-	0	0	0	0
Weapons Deliv	1	0.5	0.5	2.0	2.0	0.0	0.0
Personnel Equip	0	0	-	0	0	0	0
A-10 Total	19	-	-	156.0	8.2	1.2	1.2

SIMULATED SCHEDULED MAINTENANCE

FUNCTION	ACTUAL[1]	PREDICTED[2]
Preflt[3]	1.1	1.0
Post flt[3]	1.6	1.7
Thru flt	.7	.4
Weapons Load	1.6	1.9
Weapons Down Load	.6	.8
Fuel	.3	.2
Tow	1.6	---[4]
TOTAL	7.5	

[1]Actual times computed using Task II flight time and contractor maintenance times.

[2]Predicted times computed by AFFTC for a mature A/C, 1.8 hour average mission length, and MET predicted maintenance times.

[3]Ground handling, service, and cleaning are included in preflt and post flt figures.

[4]Required 20-30 minutes to tow to hot gun line at AFFTC. This was not deemed representative of an operational base, therefore, a time was not predicted.

REFERENCES

1. A-10A Performance and Flying Qualities Tests, Air Force Flight Test Center, Edwards AFB, California, to be published.

2. Test Plan, A-X Air Force Flight Evaluation, Air Force Flight Test Center, Edwards AFB, California, December 1971. UNCLASSIFIED

3. A-10A Flight Manual, T.O. 1A-10A-1, 1 October 1972. COMPETITION SENSITIVE

4. Contract Proposal, Part 1, Engineering Prototype and Production Model, Fairchild Republic Division, Farmingdale, New York, 7 August 1970. SECRET

5. Technical Letter Report, A-37B Weapons Delivery Training and Evaluation Program, from 6510 Test Wing/TGH to ASD/SDX, Air Force Flight Test Center, Edwards AFB, California, October 1972. UNCLASSIFIED

6. YTF34-GE-2 Turbofan Engine Operating Instructions, (Change 1-A included for YTF34/F5), SEI-306, General Electric, 5 January 1972. UNCLASSIFIED

7. Air Force Systems Command System Effectiveness Data System, AFSC Form 258/258-4 Maintenance Data Recording Procedures, Maintenance Technical Directive 69-1, 1 September 1970. UNCLASSIFIED

BIBLIOGRAPHY

Military Specification, General Specification for Aircraft Fuel System, MIL-F-38363B(USAF), 13 October 1971.

Military Specification, Installation and Calibration of Capacitor Type Liquid Quantity Gages, MIL-G-007940B(USAF), 2 February 1968.

Military Specification, Ground and Flight Tests, Aircraft Gas Turbine Propulsion System Installation, MIL-T-25920B(USAF), 10 February 1966.

Military Specification, General Specification for Antenna Systems for Airborne Identification and Navigation Equipment, 950-1200Mc, MIL-A-25730B, 10 October 1960.

Military Standard, Climatic Extremes for Military Equipment, MIL-STD-210.

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13. ABSTRACT

This report presents results of the systems evaluation portion of the A-10A prototype Air Force Flight Evaluation. The A-10A weapon system, as tested by the AFFTC, demonstrated or exhibited the potential for acceptable subsystem performance for conduct of the close air support mission. There were many features that were outstanding, or enhanced the aircraft's capability to perform its design mission. These included bombing and strafing accuracy, armament control, cockpit visibility, auxiliary power unit, and maintainability. There were several deficiencies that could have a mission impact and/or safety implication. The most important items included engine/airframe incompatibility, accessibility of cockpit controls, unacceptable operation of the heading and reference system, pilot discomfort caused by the ejection seat, and unacceptable manual reversion control in pitch. Correction of these and other deficiencies contained in this report should be accomplished on any production version of the aircraft. Evaluation of these corrections is mandatory to insure satisfactory mission accomplishment.

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